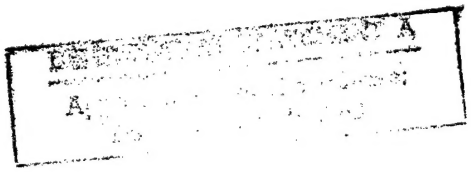
JPRS-TTP-85-013

10 May 1985

Worldwide Report

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT



FBIS FOREIGN BROADCAST INFORMATION SERVICE

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-TTP-85-013

10 May 1985

WORLDWIDE REPORT

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

CONTENTS

NEAR EAST/SOUTH ASIA

SUB-SAHARAN AFRICA

YUGOSLAVIA

PROBLEMS IN FRAGMENTED TELECOMMUNICATIONS SYSTEM

Belgrade EKONOMSKA POLITIKA in Serbo-Croatian 25 Mar 85 pp 17-19

[Article by Bernard Ostojic: "Division Brought About by Provocation"]

[Text] "The economic position of PTT [the postal, telegraph and telephone sector] is basically determined by the dualism in the treatment of the PTT as a public service and as a business. The conference takes the position (believes) that the PTT has to be treated entirely as a business and economic criteria applied in the economic employment of social resources. This should make it possible to develop the socioeconomic relations of self-management more successfully within the PTT and in relations with users of services, as well as to establish economic relations on an equal footing with other branches of the economy." The statement quoted is one of the 14 positions adopted as the conclusions of the 2-day Action Conference of Basic Organizations of the LC in the PTT, which was held last week in Pristina. This demand is nothing new at all for the Community of Yugoslav PTT Enterprises; its fulfillment is crucial to the question of whether in coming years there will be a halt to the now characteristic widening of disproportions between the needs of society for PTT services and the capability of work organizations in this activity to meet that demand.

It seems quite sufficient to illustrate that disproportion by quoting a datum repeated several times at the conference to the effect that in the previous two medium-term planning periods the plan was fulfilled at a level of 50 percent, while plan fulfillment cannot be anticipated at higher than 30 percent for the current medium-term period. Everything is taking place in a situation when no one any longer disputes the results of a number of foreign studies (similar studies have not even been done in this country) to the effect that the direct and indirect economic profit from telecommunications exceeds investments in their development many times over. A conclusion as to where Yugoslavia stands in this regard can be drawn from the report of the International Commission for World Telecommunications Development, which was created on the basis of a resolution of the UIT [International Telecommunications Union] Congress in Nairobi in 1982.

The report, which was published this January, shows among other things the percentage of national income appropriated to the development of telecommunications between 1975 and 1981 in 24 countries with differing national income.

Yugoslavia is next to last on that list, followed by Tanzania. Neighboring Greece, for example, annually invests 0.67 percent of its national income in these purposes, or 3.4-fold more than Yugoslavia (only 0.2 percent of national income). The year before last that country had 25.81 telephone subscribers per 100 inhabitants, while in the SFRY the figure was 7.47, which means that the Greek network is about 3.5-fold denser, though Greece's per capita national income is only 1.53-fold higher than that of Yugoslavia.

The fact, also taken note of at the recent conference of party members in the tourist industry, that in spite of fewer beds Greece realizes a considerably higher inflow of foreign exchange than Yugoslavia, is no doubt partly the consequence of the differences we have described in treatment of the telecommunications system. That is, they represent an essential precondition for fuller utilization of capacity, for better supply and for a higher grade of tourist services. The same applies to other branches of the economy, which needs no special proof. That is why it sounds almost absurd to hear that nevertheless the capabilities of the Yugoslav telecommunications system, assuming the targets of the long-range program for its development are attained, will only in the year 2000 reach the level which telecommunications attained in neighboring Greece (to continue the comparison) back in 1983. If we take this datum as the point of departure it really is difficult to seriously honor the assertions that any very essential steps forward will be made in treatment of the Yugoslav PTT system. What kind of treatment, then, has this been?

Solidarity and Protection of the Standard of Living

First, work organizations in the PTT industry have been required by law to organize PTT service in the regions which they cover. Second, they do not set their own rates, but rather the rates are controlled by sociopolitical communities. Since PTT service is for all practical purposes the only one of the large infrastructural systems which as a whole is not operating at a loss (nor does it receive a subsidy), it would seem that the policy of the sociopolitical communities with respect to PTT rates has not been restrictive. But a few years ago the growth of the gross income of PTT was 10 index points lower than the average for the economy. However, the volume of operations has been increasing--between 10 and 15 percent a year in telephone service, which represents about 70 percent of revenues. As the number of services has grown, then, below average income has been realized.

Within PTT service the "loser" has been postal activity, which with its labor force of 70,000 employs approximately two-thirds of all those employed in the Yugoslav PTT system. The reason for the losses is the policy of protecting the standard of living which the sociopolitical communities have been conducting for years even though the postal workers have persistently argued that these efforts were nonsensical. The theses prepared for the action conference cited the datum that this kind of protection of the standard of living had the result that postal rates increased 14-fold between 1961 and 1981, while at the same time the average personal income rose 54-fold. There cannot be any question of the impact of letters and postcards on the standard of living, since the share of expenditures for these purposes in family budgets is measured in promilles, as the postal workers say.

At the same time, the losses of postal service amounted to about 6.7 billion dinars last year alone. Through the system of internal prices these losses are covered from telephone service, the only service operating in the black, and it also covers the losses of telegraph service (considerably smaller, to be sure). This "solidarity" has its price, which the entire social community is paying indirectly. The point is that the reproductive capability of PTT activity as a whole is essentially reduced. Postal and telegraph service are mainly (on the average) at the level of simple reproduction, and the accumulative capacity of telephone service has been dropping year after year. That is why credit (under commercial terms and conditions) has been used to finance development programs (plans), and that has led to the fact that 80 percent of total accumulation in the Yugoslav PTT Community goes to pay off obligations arising out of those credits. Only about 3 billion dinars a year is left "uncommitted," which in the context of the high rate of inflation and increased demand for PTT services, essentially narrows the space for optimum investment.

It is significant, that is, that these circumstances even objectively constitute additional pressure on distribution of the available accumulation to the advantage of local capacities and to the detriment of joint capacities. For years now the "traffic capacity" of the trunk lines of the Yugoslav PTT system has fallen short of the requirements dictated by the local network, although, as we have already said, the latter is at a level that is far from satisfactory both with respect to the demand and by comparison with the average of other (European) countries.

The way in which the Yugoslav PTT system is organized also contributes essentially to this kind of distribution of new (inadequate) investments, whose insufficiency has the result that they cannot be properly utilized. As it was decidedly stated in the gathering of party members in the PTT sector, the problem here is not the number of elements making up the Yugoslav PTT system (349 basic organizations of associated labor, 52 work organizations and 4 complex organizations of associated labor). The problem lies in the fact that these elements are turned into instruments for executing an ever more pronounced effort, which is not confined to PTT activity, at all costs to attract the maximum portion of accumulation and revenues, that is, to retain them in the regions which they cover--instead of being organized exclusively as operating engineering and technological entities so that they perform their function in the most optimum possible way.

Economic (Dis)unity

Since most (about 70 percent) of the gross revenues of PTT activity is the product of joint operation of several organizational units, it is quite understandable that the distribution of that revenue is the subject of the fiercest disputes. The main reasons why opposing positions are taken concerning all the solutions proposed so far for distribution (agreements on mutual economic relations) is, put most briefly, the differing economic position of work organizations in PTT service, that is, the fact that the costs per unit service differ essentially from one organization of associated labor to another. The differences occur above all because of the uneven regional development of the economic infrastructure and the PTT infrastructure. That is why a number of

work organizations are compelled to use the capacities of others more than making their own available. This naturally has to be paid for, which these work organizations do not dispute, but still they do not accept it, since this would cause losses for them and make it impossible for them to perform the activities whose performance is required by law. At the same time the work organizations providing the largest portion of the joint facilities are demanding that their work be evaluated in conformity with the Law on Associated Labor.

The use of revenues (or accumulation) to develop the local network at the expense of the trunk network is also a quite logical thing in view of the fact that the increase in the number of users of PTT services is practically the only source of a growth of income.

The conclusion necessarily imposes itself from all this that the exclusive authority of the organization of associated labor with respect to disposition of the income they realize is the principal factor operating toward disintegration of the entire PTT system as a unified engineering and technological entity. The position that a system that is unified in the economic sense is a prerequisite for the engineering and technological unity of Yugoslav PTT service is valid beyond dispute in this context. It is also probably valid (in the same context) that serious consideration had to be given in the meeting of party members in the PTT sector to the proposal which was presented without much fanfare that in establishing economic unity "we should not shrink even from intervention by the SFRY Assembly" nor from formation of separate work organizations to manage the trunk network of the PTT system.

However, there should be even less dispute about there being a firm relationship between the behavior described on the part of the organizational units of PTT service when it comes to regulating their economic relations and the way in which they dispose of income and the powers which they have when it comes to defining the conditions under which they conduct their economic activity. In other words, in a situation when their abilities to influence their own economic position have been almost entirely taken away--exclusive powers with respect to management of their own income could not have resulted in anything other than a schism which is a direct threat to the engineering and technological unity of PTT service. So that the phrase "unified economic system" of the PTT sector--the need for engineering and technological unity has so far not been disputed at all--might imply above all the position that PTT activity should be treated as a business even in the sense of determining economic conditions. We say "might imply" because the participants in a large number of discussions related to enactment of the Law of Planning, especially recent ones, have mainly divided up into those who are for and those who are opponents of "economic unity" in large systems in general--although nowhere has it been explicitly stated what is specifically meant by "economic unity." Only on those foundations, it seems, is it realistic to expect the adoption and implementation (financing) of consistent development programs whose basic content would be to define the capacities which have priority from the standpoint of the entire system and the choice of optimum technologies, equipment, etc.--which is certainly implied by the term "economic unity."

Of course, advocating broader powers for large infrastructural systems in determining the position which they take in primary distribution should be distinguished from attempts to have the rates of those systems set on the cost principle. An economically unified system would have to be a system in which the same value is paid for the same work even though the "real" prices of the same services in all parts of that system are not the same because of differences in costs (which cannot be influenced). Translated into the terms of PTT service, put most simply, this means that the post offices located far from the trunk line have to exist and operate under the same conditions as those in the large centers even though they have incomparably smaller traffic than the others and even though they have considerably higher costs per unit service. This in fact applies to all large infrastructural systems.

Legislative intervention in the sense of making the community responsible for investments or in regulating relations so as to guarantee optimum operation of the PTT system might possibly be justified on the same foundations (that is, when the position in primary distribution is changed). But the changes anticipated in this domain, it is certain, would essentially diminish the probability that a situation would come about that would compel interventions of that kind. This way (that is, without them) Yugoslav PTT service is in a position where it cannot effectively respond to demand. As a practical matter this leaves it without arguments to support the protests (which on several occasions were repeated in the action conference of party members in the PTT sector--against the development of parallel functional telecommunications systems under circumstances when such systems are not indispensable, that is, when it is possible to replace them (more inexpensively) with public PTT connections, assuming, of course, that the investment is made in them.

[Box, p 19, bottom]

Government Rates

The level of development of our network contrasts sharply with the average in the advanced countries of Europe and indeed our neighbors (except for one), and it is also characterized by unevenness of the network's development from one region to another within the country, in which there are some regions that have only two telephones per 100 inhabitants. We truly cannot be satisfied when we realize that there are as many applications for new telephones as the number that exist (about 2.5 million), while at the same time we have ever more pronounced demands on the part of the economy for the introduction of new services, demands for transit and further connection with neighbors.... Only in 1990 will we fulfill certain planning targets contained in this plan, and according to certain indicators in the year 2000 we would be at the level of development of, say, Greece in 1983.... The reason for this situation, put most simply, is that economic laws have not been sufficiently operative in this sector. We are performing the function of a public service, but we are operating as a business under the conditions of the government setting rates for almost all services. We think that the price disparity, above all in the case of postal services, can no longer be retained and that there is the greatest justification for ensuring expanded reproduction with economic rates along with corresponding influence of users of PTT services on the further

development of the PTT," said Vucic Cagorovic, director of the Community of Yugoslav PTT Enterprises at the Action Conference of Basic Organizations of the LC in Yugoslav PTT Basic Organizations of Associated Labor in Pristina.

[Box, p 19, top]

Competition

"... The development of communications in our country has not been directed in the manner in which this is done by the advanced countries of both West and East. That is, instead of by the Yugoslav PTT, that development has been guided by manufacturers of telecommunications equipment, which have not, however, shown themselves to be immune to a considerably more widespread practice of developing parallel technologies on the basis of differing licenses (the case of the pharmaceutical, automobile and other industries). Theer are thus cases when the interests of several transnational companies collide on our market, they push each other out, and this also has repercussions for our own manufacturers, who are unable to sell their own products. Since in our country a factory which cannot produce does not go under (as is the case in the capitalist world), the bills are paid by society.... Just for the sake of illustration, telephone switchboards are produced in our country by 'Tesla' under a license from 'Erickson,' by 'Iskra' under a license from AIDIT, and by EI-Nis under a license from 'Siemens.' Unfortunately, the Yugoslav PTT does not have the strength to take the initiative and establish a single joint product (on the basis of one license) and to develop further and install that product as its own. Yugoslavia is far too small a market when it comes to the telecommunications equipment industry even for one product, much less three or four,..." said Tatjana Holjevac (Zagreb PTT) at the action conference of party members of the PTT sector in Pristina held 13 and 14 March.

7045
CSO: 5500/3019

ARGENTINA

COMPLETION OF SATELLITE SYSTEM STUDIES ANNOUNCED

PY112132 Buenos Aires TELAM in Spanish 1514 GMT 11 Apr 85

[Text] Buenos Aires, 11 Apr (TELAM)--Argentina has requested that two parking sites in a geostationary orbit and their respective frequencies be reserved so that in the future it can install two telecommunications satellites as part of a national multipurpose system, Communications Secretary Humberto Ciancaglini announced today. The request for the positions at 80 and 85 degrees longitude west was made to the International Telecommunications Union (UIT) by the Communications Secretariat of the Public Service and Works Ministry.

With the request, Secretary Ciancaglini affirmed, the country is reserving for its use the two most adequate orbital sites for positioning two satellites, orbital sites that are available to UIT country members.

The communications secretary explained that the decision was made in light of studies conducted by a technical commission that also determined the characteristics the Argentine satellite system should have. He added that the formal request for the two orbital sites was based on these studies.

Ciancaglini explained that the space components of the system will be comprised of the Nahuel I and Nahuel II satellites, which will allow coverage of the entire nation, including the island territories, with such important services as interurban and rural telephony, national and regional television service both for individuals and communities, the transmission of television signals for program exchange among channels, and data transmission.

During a press conference this morning, Ciancaglini pointed out that the system to be installed can become a powerful instrument for social services, such as educational television and television-assisted medical care, as well as complement the existing national telecommunications infrastructure.

Each satellite in the Nahuel series will weigh between 1,000 and 1,200 kilograms at launching, and have a structure and payload weight of 500 to 650 kilograms, a useful lifespan of 9 to 10 years, and a radio frequency power of 320 to 360 w.

They will have up to 5,000 duplex channels for interurban telephony, 2,000 channels for rural telephony, 2,000 channels for high-speed data transmission, a channel for direct regional transmission equivalent to 100 telephone circuits, and 4,000 circuits for low-speed data transmission.

The communications secretary praised the work of the technical commission over which he and the head of the National Space Research Commission (CNIE), Jorge Pedro Garcia, preside.

At the end of his press conference, Ciancaglini noted the importance of the feasibility studies for the installation of two national satellites that have been completed with the participation of highly qualified professionals.

CSO: 5500/2066

ARGENTINA

ENTEL'S LETHARGIC OPERATIONS BLAMED ON POOR ADMINISTRATORS

Buenos Aires CLARIN in Spanish 23 Mar 85 p 23

[Text] A series of irregularities in the current administration of ENTEL [National Telecommunications Company] was denounced by a group of national deputies, led by Dr Miguel Jose Martinez Marquez (UCR [Radical Civic Union]-Cordoba), who described the leadership of the state enterprise as "ineffective."

The lengthy report centers its criticism on the lack of sound structure for the ENTEL departments, based on needs and potential. This brings anarchy into the company's operations.

The report cites: "structurally poorly located departments, duplication of functions, groups of advisers, transfer of authority and of responsibility, and indiscriminate appointments."

The deputies criticized the fact that special commissions are appointed to handle routine operational problems, bypassing the duties of specific departments. It states that in this way responsibility for solving such problems is distorted and evaded, thus adding "incoherence to the decision-making process."

The group of legislators also said: "At present ENTEL's managerial inertia creates numerous pressures for those businesses involved with telecommunications. A statement has already been issued by the business chamber that represents the interests of these companies, but to date no response has been made to their concerns."

The report further cites "the deterioration of the stock of parts, and in particular, in their supply to small and midsized businesses, which are now systematically having to shut down."

With reference to the investment plan, it was said that it has been allowed to be cut drastically without any attempts being made to defend it; the restrictions on purchases of parts and equipment were noted, and defects

in international service were cited, while at the same time--in relation to projects of social benefit--the report denounced "manifest and perfectly obvious irregularities that create high economic and social costs for business, and which are borne by their workers."

After calling for probing questioning of the Sovereign Plan, the group of legislators concluded: "In summary, to describe the state of affairs at ENTEL, we might conclude that there is total operational anarchy, with an overly centralized, erratic leadership, totally devoid of the most elementary sense of federalism, backed up by a resolute indolence. This situation is creating damage, in some cases even irreparable damage, to the programs which our nation needs and expects from ENTEL."

7679
CSO: 5500/2063

ARGENTINA

AEDBA VOICES CONCERN OVER NEW RADIO BROADCASTNG BILL

Buenos Aires CLARIN in Spanish 26 Mar 85 p 33

[Text] The head of COMFER [Federal Broadcasting Committee], Pedro Sanchez, yesterday told representatives of the AEDBA [Association of Buenos Aires Newspaper Editors and Publishers] that "the best broadcasting law is the one which places the fewest restrictions and limitations on free access to telecommunications, and in particular, to broadcasting."

The Bill

Sanchez also confirmed to the AEDBA members that in early April COMFER will submit to President Raul Alfonsin a draft of the future broadcasting bill that his organization is supporting. It will include the proposals developed by COMFER.

The COMFER head met at noon with a delegation from AEDBA, led by its president, Saturnino Herrero Mitjans (CLARIN), along with the vice president, Manuel Campos Carles (LA NACION), the treasurer, Enrique Abramic (EL CRONISTA COMERCIAL), and its manager, Roberto Brozos.

Explanation

At the conclusion of their meeting, Herrero Mitjans explained that the purpose of their visit to Sanchez was to express AEDBA's concern about the provisions of the future broadcasting law, and about the lack of clarity prevailing about conducting new calls for bidding proposals for radio stations and channels.

On this topic, it is worthwhile to note that the current law, law 22,285, bars access by the print media to bids and later contract awards, a provision stipulated in article 45, section E.

Herrero Mitjans pointed out that even though "this is the most serious of the current limitations, we are also concerned about limitations that might be extended in the future law concerning the development of telecommunications to be used by the written press."

"Technological Death"

The AEDBA president warned about a possible "technological death" of the print media in the mid-term period, as the current legislation still limits the use of what are called "complementary services"; that means, the use of communications not using waves--such as cable radio or television, or closed circuit television systems.

Nonetheless, he noted that during his talk with Sanchez, the COMFER official assured him that in early April COMFER will submit to the chief executive a draft of a broadcasting bill in which AEDBA's proposals would be considered.

He also mentioned Sanchez's remark that "if the best press law is the one that remains unwritten, the best broadcasting law is the one which places the fewest restrictions and limitations on free access to telecommunications, and in particular, to broadcasting."

7679
CSO: 5500/2063

BRIEFS

GOVERNMENT SATELLITE PLANNING FAULTED--Iberoamericana University researcher Fatima Fernandex Christlieb said yesterday that despite the proximity of the date for putting the Morelos Satellite System into orbit, no government agency has come up with a specific project for the use of that important means of communication. Everthing seems to indicate, she said, that the exponents of the project are the private television concessionaries, who are the only ones that apparently already have a definite project for the use of the system. She added that in view of the rapid transformations taking place in our country, it is important that the analysis of the new information technologies available to Mexico get underway. For that reason, the Mexican Association of Communications Researchers intends to analyze in its meeting of 13-14 March the prospects of the use of that means for culture and mass communication. She also said that our country lacks a program to train human resources in satellite communications, and that the technicians currently being trained at Hughes--the satellite manufacturing enterprise--will be merely button-pushing operators. [Text] [Mexico City EXCELSIOR in Spanish 9 Feb 85 p 20-A] 8414

CSO: 5500/2049

PERU

TELEPHONE COMPANY TO INSTALL FIBER OPTICS SYSTEM

Lima EL DIARIO DE MARKA in Spanish 12 Feb 85 p 7

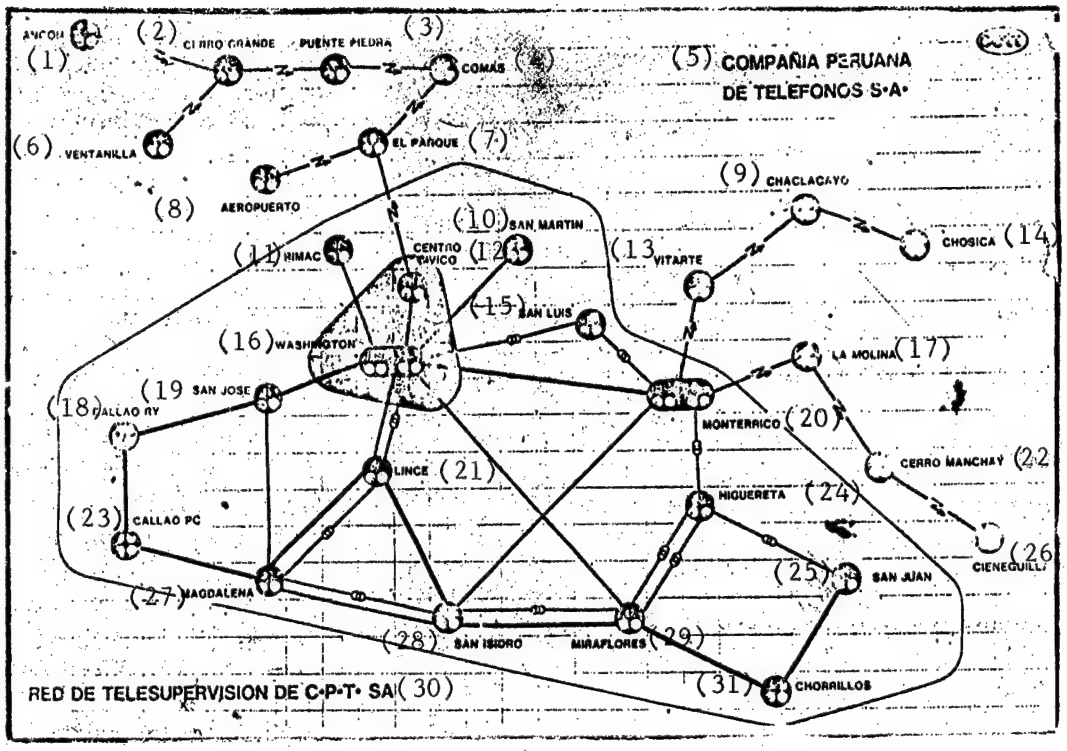
[Text] With the arrival of the first shipment of the modern glass fiber (optical fiber) which will replace the copper conductors and which instead of electric current uses light (laser rays), the Peruvian Telephone Company [CPT] will be using the most modern material in the world as telephone conductors on the new NEC lines.

All 28 central telephone exchanges will be interconnected with this system of new conductors which will provide faster and smoother sound transmission, with simple maintenance.

Furthermore, the modern cable system, installed at the main telephone exchange in the Washington district, will provide the capability for determining, within seconds, where a breakdown, either chance or intentional, has occurred.

The work on outdoor equipment and the installation of new telephone exchanges is progressing on schedule and according to plans by the CPT central directors.

DIARIO DE MARKA has also been informed that the renovation and adaptation of the old telephone lines in the center of Lima to the dial system will be carried out in accordance with the approved plan.



Key:
1. Ancon
2. Cerro Grande
3. Puente Piedra
4. Comas
5. Peruvian Telephone Company
6. Ventanilla
7. El Parque
8. Airport
9. Chaclacayo
10. San Martin
11. Rimac
12. Civic Center
13. Vitarte
14. Chosica
15. San Luis
16. Washington
17. La Molina
18. Callao Ry
19. San Jose
20. Monterrico
21. Lince
22. Cerro Manchay
23. Callao PC
24. Higuereta
25. San Juan
26. Cienguilla
27. Magdelena
28. San Isidro
29. Miraflores
30. Peruvian Telephone Company Telesupervision Network, Corporation
31. Chorrillos

CSO: 5500/2047

PERU

BRIEFS

DECREE MODIFIES GENERAL LAW--State public or private establishments are now required to allow the installation of telecommunications services in their facilities when they are so required by the public telecommunications service agency; if they do not do so, they will be fined. This change was made in the general telecommunications law by means of a modification introduced in a legislative decree. It was introduced in order to support the development of these services and adapt them to meet current needs. According to this provision, published yesterday in the official journal, EL PERUANO, the state recognizes and protects the right to secrecy in telecommunications. Information transmitted by telecommunications services may not be intercepted, published, or disseminated. The decree also states that the undue appropriation of telecommunications signals by menas of technical devices will be considered a crime against property. The legislative decree further says that ham radio operators are prohibited from transmitting communications of a political or commercial nature. [Excerpt] [Lima EL COMERCIO in Spanish 14 Mar 85 p A-7] 7679

CSO: 5500/2060

INDIA

WORK ON REMOTE-SENSING SATELLITES SAID TO BE SLOW

Calcutta THE STATESMAN in English 3 Apr 85 p 4

[Text] MIDNAPORE, April 2--Work on remote-sensing satellites in the eastern region is progressing slowly. Of the 10 eastern States, only Orissa and Bihar have shown some interest, according to some scientists engaged in the work at the Indian Institute of Technology, Kharagpur.

Orissa has come to be the pioneer State in the eastern region by setting up the country's third Remote Sensing Application Centre, in Bhubaneswar, after U.P. and Tamil Nadu. The fourth centre will come up in Bhopal in a few months and the fifth in Rajasthan.

Two workshops on remote-sensing were organized in Bhubaneswar in collaboration with the Union Department of Science and Technology, its Orissa unit and the Eastern Regional Remote Sensing Service, IIT, Kharagpur, during the past three years. A similar workshop was held in Patna by the Union and State Departments of Science and Technology and the IIT, Kharagpur.

But no such workshop has yet been organized in West Bengal, the scientists regretted. Dearth of funds, non-availability of computer and other instruments are said to be the constraints. The Regional Remote Sensing Service, Kharagpur has, however, submitted a plan estimate of Rs 56 lakhs to the State Planning Board, West Bengal.

It was earlier decided that remote-sensing cells in all the States should go in full stream at least a year ahead of the launching of the Indian Remote Sensing Satellite I (IRS-I), the first of a series of operational satellites, in June 1986, mainly for resource management. Once the IRS-I goes into space, the data flow will be immense, it is said.

The Department of Space has, therefore, formulated a programme for the optimum use of the data flow from IRS-I. Five regional remote-sensing centres have been set up. Two more centres--one in the North-eastern zone and the other in Jammu and Kashmir--will be set up at the end of the Seventh Plan.

The Eastern Regional Centre, at Kharagpur, has already begun data analysis by eminent scientists. The centre will train officials and other scientists when it will be fully operational in December.

CSO: 5550/0067

GROUP FORMED TO ADVANCE SATELLITE UTILIZATION

Madras THE HINDU in English 23 Feb 85 p 7

[Text] NEW DELHI, Feb. 22.

An Inter-Ministerial Committee of officials is being set up to function as a "single window" for speedy clearance of proposals for import of equipment needed for full utilisation of the domestic satellite, INSAT 1-B, launched nearly two years ago.

The decision to provide for "single window" clearance was taken at a meeting of representatives of the ministries concerned.

This meeting, held recently by the Secretary to the Department of Space, Dr. U. R. Rao, followed a review of the progress of utilisation of INSAT 1-B by the Prime Minister, Mr. Rajiv Gandhi, soon after assuming office. Mr. Gandhi reportedly felt that the pace of utilisation needed to be accelerated and the Government machinery geared for this purpose.

Underutilised: The review brought out that against the total capacity of 5,000 circuits available for telecommunication purposes, only 2,000 have so far been loaded. It was envisaged that by the third year of launching of the satellite, the full capacity should be utilised, as the life span of the satellite is only seven years. In other words, by 1986, all the 5,000 circuits have to be loaded.

In regard to television, however, both the S band transponders have been fully utilised and a plan for utilising the "C" band transponder for television coverage of the north-eastern region is now under way.

So far as the telecom segment is concerned, besides the P and T Department many organisations have individually evinced interest in hiring dedicated circuits. For instance, the National Thermal Power Corporation (NTPC) wants to link its five super-thermal power stations with communication through satellite. The National Fertilizers Ltd., is one such organisation.

Terminal equipment wanting: One of the constraints to speedy finalisation of these proposals is said to be the delay in getting the required terminal equipment, some of which are made indigenously and others have to be imported. Even in respect of those indigenously made, certain components have to be imported. The present procedures for getting clearance for such imports are cumbersome and time-consuming. The idea of a "single window" clearance has been mooted to get over the hurdles and ensure speedy clearance.

The Inter-Ministerial Committee will include representatives of the Departments of Space, Telecommunications, Finance, Industries and the Director-General of Technical Development (DGTD). A senior official of the Department of Electronics will be its Member-Secretary.

CSO: 5550/0055

RAJIV NOTES SLACKNESS IN SATELLITE UTILIZATION

Calcutta THE STATESMAN in English 15 Mar 85 p 9

[Text] NEW DELHI, March 14.—Mr Rajiv Gandhi wants to race into the 21st century. God speed to him, one would say. But the way some of the Central departments are moving, Mr Gandhi might well find himself alone at the winning post.

The Prime Minister is, obviously, well aware of it. An indication of this was the sharp reminder he gave to the departments concerned about the slackness in utilizing fully the facilities available through the domestic satellite system.

The satellite (INSAT) has been operational since 1983 for telecommunication, television and meteorological use. What has been the record of the telecommunication segment, for instance? The department had set for itself a target of using 2,000 circuits by October, 1984. But the figure to date is still around, 1,600 circuits almost static since September.

Are there no takers? Far from it. Aizawal, Kavaratti, (Minicoy Islands) and Leh are among the far-flung areas which have yet to receive telecommunication benefits of the satellite system. The Oil and Natural Gas Commission would like to use the satellite to monitor the supply from off-shore wells in south Bassein. National Fertilizers Limited would be keen to have a satellite link with its project near Guna, in Madhya Pradesh.

The Reserve Bank, State Bank and some nationalized banks have been inquiring about the possibilities of using the link among their branches in the country. The print media has been waiting to make use of its facilities. The list of users would swell further if only the department is able to show a little less lethargy in its response.

The satellite provides 5,000 two-way long-distance telephone circuits. The Posts and Telegraphs Department planned to utilize 1,600 to 2,000 circuits in the first year (1984) and another 1,600 circuits in the subsequent year (1985), leaving the balance for emergency use.

Far from fulfilling even the first year's target, there is every indication that there would be a further slippage this year unless the department is galvanized into action. This is, indeed, necessary considering that the available period of the satellite is seven years and that it has cost the nation nearly Rs 200 crores.

CSO: 5550/0056

MINISTER TELLS PROBLEMS WITH LOW-POWER BROADCASTING

Calcutta THE STATESMAN in English 19 Mar 85 p 9

[Text]

NEW DELHI, March 18.—The Information and Broadcasting Minister, Mr V. N. Gadgil, admitted in the Lok Sabha today that there were problems at some low-power centres of Doordarshan.

In Bhopal, he said, the picture was clear but the sound inaudible. Mr Gadgil added: "I do not want to hide anything from the House. We wrote to the manufacturer. Some components were replaced."

He also told the House that there had been complaints from as many as six centres about non-receipt of staff salaries.

He added, however, that remedial action had been taken immediately, and the nearest All-India Radio station directed to pay the salaries. "At these places, the salaries were paid late, because no station engineer was posted, or reached the place", he explained.

The Minister admitted that the staff of such centres had two other problems. One related to accommodation, because some centres were in remote areas. "My predecessor had written to various Chief Minister to help out in this matter."

Another problem is that the Government has not been able to appoint assistant engineers at these centres. This is because there was a dispute between degree-holders and diploma-holders, and the matter was referred to court. "Now we revised the rules and sent them to the UPSC for its approval". Once the approval is received, assistant engineers would be appointed.

Mr Gadgil was replying to supplementaries to a question based on a report in The Statesman of March 2/3.

He said that "for the story that was published by the newspaper, we issued a contradiction and they published it". He, however, went on to supply details which confirmed much of what was stated in the report.

One point in the report related to Bhatinda interfering with the reception from Jalandhar and Lahore and the consequent manhandling of an engineer by irate viewers. Mr Gadgil said he had yet to get a report on the manhandling.

The main question, put by Mr G. G. Swell (Congress I), and Mr K. P. Unnikrishnan (Congress S), was whether the present Doordarshan low-power transmitters were a passing phase and would be replaced by high-power ones; whether 50% of those transmitters were defective and shifted from one place to another to maintain the Sixth Plan target.

CSO: 5550/0057

GOVERNMENT ANNOUNCES NEW POLICY ON ELECTRONICS

Calcutta THE TELEGRAPH in English 22 Mar 85 p 8

[Text] **New Delhi, March 21** (UNI, PTI): The government announced today the much-awaited new electronics policy which would drastically liberalise imports and licensing.

It provides for import of technology "freely," "welcomes" the Fera companies investing in high technology areas, and lifts the bar on companies, including those with foreign equity of 40 per cent or less, from fields so far open to the organised sector."

The statement on "Integrated policy measures for electronics" was made by the minister of state for electronics, Mr Shivraj Patil.

It sets a target for the country to produce Rs 10,000 crores worth of electronic goods by 1989-90 and reduce their prices to bring them "near the international prices."

Production of a number of consumer entertainment electronic items has been delicenced in cases where resources are not drawn from financial institutions.

These include, radio receivers, tape recorders, two-in-ones, amplifiers, record players, record changers, television sets—both black and white and colour—and CTV systems.

Also, manufacture of some of the components so far reserved for the small sector has been opened up.

To make all data on the electronics industry available at one point, all units, in organised and small sector, will now be required to submit annually a "single proforma" to the electronics department.

The bar on manufacture of components from intermediate level is being lifted in the case of biopolar, linear and digital integrated circuits, provided a minimum of Rs 5 crores is invested.

Broadbanding

According to the new policy, "broad band" licences will be issued to a number of entertainment electronic items, electronic toys, computer peripherals, electronic test and measuring instruments to optimally utilise the investments.

Mr Patil said a new industrial and licencing policy for manufacture of video cassette recorders, video cassette players and microwave ovens was being drawn up.

He said once a licence is given, after strict scrutiny, the licence would be "assured of liberal upward growth." Also, greater efforts would be made to develop electronics industry in hill areas "on a larger scale."

Centralised purchase

Mr Patil said centralised purchase of technology will resorted to only if a variety of technologies renders the indigenous products costly in comparison with international prices "because one of the objectives of the policy is to make equipment available at near international prices."

According to the new policy, electronic units will be allowed to be set up in any "permissible" location.

The exemptions from sections 21 and 22 of the MRTP Act are being extended to materials for

electronics, computers, broadcasting equipment, control instrumentation, and industrial and professional electronics, and communication equipment.

Manpower

The statement underlines the importance of "manpower development" in electronics, which is a knowledge-intensive area characterised by rapid innovation as well as obsolescence, and goes on to detail some of the important steps in this direction.

These include teachers' training programmes "being initiated" at Bombay, Delhi, Kanpur ad Madras IITs, and Jadavpur University in computer sciences, and identification of 28 centres for starting one year, post-BSc diploma course in computer application.

Enumerating a series of measures taken or being taken to step up research and development, Mr Patil said a centre for development of materials for electronics was proposed to be set up.

It is now proposed to set up an ESS factory using the technology being developed by the centre for development of telematics (CDOT).

The government investment in the venture will be restricted to 26 per cent, with 25 per cent private sector investment and 49 per cent thrown open to the public. Action to modify the industrial policy resolution, in this connection, "will be taken."

Later, explaining the objectives of the new policy, Mr S.R. Vijayakar, secretary to the department of electronics told newsmen that it aimed at bringing electronic equipment to the international price level and to make a dent on smuggling.

CSO: 5550/0063

TELECOM PLAN WILL CALL FOR LARGE TRAINED MANPOWER

Madras THE HINDU in English 20 Mar 85 p 28

[Text] MADRAS

The Seventh Plan for Telecommunications proposes an investment of Rs. 12,625 crores. The pace of this plan depends to a great extent on the organisation and proper utilisation of human resources. Consequently manpower planning through building up of requisite skills has become necessary.

Of this massive outlay of Rs. 12,625 crores, investment in local switching network including ducts, is Rs. 7,163 crores. The telecom cable constitutes an important component of this network and the funding for this is 30-35 per cent of the investment in switching.

The Seventh Plan objective is to add an exchange capacity of 50.85 lakhs. Based on needs, the estimated distribution of switching capacity will be 36 per cent in Metro district, nine per cent in major district, 11 per cent in minor district and 44 per cent in circles.

Official sources indicate that the pace of physical development proposed is fast. The achievement in the Sixth Plan is likely to be 10.2 lakh lines. It is expected that the actual achievement in the Seventh Plan will be 80 per cent.

It is pointed out that the success in providing efficient telecom service depends on the availability of skills at the appropriate time. Many examples exist of the number of officers barely meeting the requirements of the job. Many a time trained officers in one department are called upon to fill such jobs due to shortage of competent trained engineers. These sources explain that the skills and knowledge of one particular branch bears no relation to those required of the others; and all too often an officer becomes a poor engineer in an unsuitable job. Hence it is necessary that well planned training programmes should be chalked out for engineering officers before they are posted. This is essential because cable technology is changing fast and telecom engineers need specialised training in cable planning, construction and pressurisation concepts. New equipment and testing aids are continually inducted into the system. The latest in these are; digital cables, optical fibre cables, new jointing techniques, thermo shrink sheath closers, connectorised joints and repair sleeves.

The telecom technical staff are of the view that the existing knowledge and training methods are not sufficient to absorb techniques of new designs and concepts in cable technology.

At present there is an impression among cable engineers that there is no recognition of the contribution made by them in the development activities. They, therefore, suggest that arrangements be made for exchange of engineers within the country and abroad

In the interests of service efficiency, it is suggested that the Telecom Traffic Service and the Telecom Engineering Service should be merged.

CSO: 5550/0061

MINISTER OPENS NEW ELECTRONIC TELEPHONE EXCHANGE

Calcutta THE TELEGRAPH in English 21 Mar 85 p 4

[Text] **Calcutta, March 20:** A Rs 500-crore plan to modernise Calcutta Telephones is being considered by the government, the Union minister of state for communications, Mr Ram Niwas Mirdha, said while speaking at the inaugural ceremony of the Bidhan Nagar electronic telephone exchange here today.

The exchange is the first of its kind in the city and fourth in the country and has a 5000-line capacity. Completed at a cost of Rs 670 lakhs, the exchange coded 37, is fully computerised.

Mr Mirdha said three new digital exchanges would be set up by the Calcutta Telephones next year with a capacity of 10,000 lines each. With these schemes implemented, Mr Mirdha hoped that Calcutta Telephones will be able to add about 2 lakh new lines to its capacity and replace the old exchange equipment of about 1 lakh lines. There are 63,750 lines in the city which are more than 25 years old, of which 50,750 lines will be replaced in the next two to three years, he said.

Mr Mirdha said another electronic exchange with a capacity of 10,000 lines will also be commissioned at Telephone Bhavan, replacing the existing level of 23 exchange there. He hoped that the second electronic exchange would go a long way in ensuring proper telephone services in the city.

The chief minister, Mr Jyoti Basu, welcomed the scheme and said he was "happy" and "optimistic" about the future proposals in the sphere of telecommunications. He said such modern exchanges would give a "fillip" to communication development in the country.

Pointing out that cable thefts often crippled the telephone system in the city, Mr Basu urged the police to check such thefts and stressed coordinated efforts by all public utility agencies to ensure smooth functioning of the telephones. He also conceded the need for replacement of the old telephone lines and modernisation of telecommunication equipment.

Mr Ashoke Sen, Union law minister, said the new exchange was a fitting tribute to the late chief minister Bidhan Chandra Roy who was the "architect" of modern Bengal.

With the opening of the Bidhan Nagar electronic exchange, the number of total exchanges under Calcutta Telephones increases to 49 and the equipped capacity to 2,31,800 lines. The exchange will provide about 2,000 new connections in the Bidhan Nagar area.

CSO: 5550/0064

INDIA

NEED FOR MEDIA NETWORK IN TRIBAL AREAS STRESSED

New Delhi PATRIOT in English 23 Mar 85 p 6

[Text]

Ranchi, March 22—A study by the Union Home Ministry has stressed the need for a strong multipurpose communication media in all the industrial and mining centres in the tribal areas to convince the tribals and make them agree to the proposals and measures for industrialisation.

This is considered to be one of the most effective methods to contain agitations in tribal areas of Bihar in the wake of acquisition of land for setting up industrial units and hydro electric stations, the report says.

This is part of a package of programmes suggested by the Ministry's project on "Impact of industrialisation on the tribes of India" to deal with problems being faced by the Government in the speedy execution of industrial projects in tribal areas, particularly in Bihar.

The research project has also recommended for setting up a special machinery to look after the tribals and tribal areas affected by the industrial and mining development and to find ways and means for solving problems arising thereof.

The report of the research project running into 600 pages was released here yesterday by Dr L P Vidyarthy, professor of anthropology at the Ranchi University and director of the Aid Research Project.

The project initiated in 1981, selected five industrial centres of Bihar — Bokaro Thermal power station, Bokaro steel complex, Jamshedpur steel complex, BERMO areas of the Central Coalfields and Lalamtia areas of the eastern Coalfields for intensive study.

While relating some of the problems faced by the tribals, Dr Vidyarthy said though the industrialisation brought about advancement in the material culture of these people, it caused undesirable socio-economic and cultural disorganisation in the traditional society.

The study report, Dr Vidyarthy said, however did not favour abandoning the plans of industrialisation in tribal areas. Instead it has recommended for undertaking correctional measures like adequate housing facilities and payment of adequate subsidies to displaced persons.

Dr Vidyarthy also released a research project report titled "Cradle to playground: Process of socialisation in tribal Bihar".

CSO: 5550/0065

BRIEFS

NEW STD FACILITIES--MADRAS, Feb. 21--The Subscriber Trunk Dialling facility has been extended to Tiruchengode. The service to Tiruchengode (code 04288) was inaugurated there today by Mr. M. G. Jayaraman, Additional General Manager, Telecommunications, who made the first call to Mr. A. V. S. Mani, General Manager, Telecom Projects, Southern Region, in Madras. Mr. V. Palaniswamy, Collector of Salem, was the chief guest at the function, which was presided over by Mr. V. P. Ramakrishnan, Director, Telecommunications, Coimbatore. Linking the 996 telephone subscribers in Tiruchengode to the rest of the country is a 2.6 MHz, small-tube, coaxial cable that can provide 600 high-grade trunk circuits. To begin with, however, the Tiruchengode telephone exchange is being equipped to handle up to 33 simultaneous STD calls. STD for Neyveli from Feb. 25: The STD facility to Neyveli is to be inaugurateed on February 25 by Mr. K. Thomas Kora, Secretary, Department of Telecommunications. The calls will be carried by a 24 circuit UHF radio link that has been established between Neyveli and Cuddalore. The code for Neyveli is 04148. [Text] [Madras THE HINDU in English 22 Feb 85 p 12]

NATIONAL RADIO CHANNEL--NEW DELHI, March 18--A national radio channel is to be set up for broadcasting programmes aimed at providing information, education and entertainment to both rural and urban areas, reports UNI. At present, local radio stations "plug" on to Delhi only for the news bulletins and certain selected programmes. The other important programmes outlined in the 1985-86 Budget proposals include introduction of an integrated service for the external division. New radio stations are to be set up at Agra, Jamshedpur, Gangtok, Madurai and Tura, apart from local stations at Adilabad, Keonjhar, Kota and Sholapur. Transmitters will be upgraded at nine stations and seven auxilliary stations converted into full-fledged stations by setting up permanent studios. [Text] [Calcutta THE STATESMAN in English 19 Mar 85 p 7]

BROADCASTING SERVICE PLANS--New Delhi, March 18 (PTI)--The Union government has decided to constitute "A" Central service called the Indian Broadcasting (programme) Service with comparable grades and scales in similar services, the Lok Sabha was informed today. The minister of state for information and broadcasting, Mr. V. N. Gadgil, said the new service would have separate cadres for AIR and Doordarshan and separate sub-cadres within the media to meet the needs of programme management and production. He said initial recruitment to the service would be in the junior time scale (Rs 700-1300). It was also expected that eventually officers suitable to head the AIR and Doorsarshan would be available from within the service, Mr Gadgil said. [Text] [Calcutta THE TELEGRAPH in English 19 Mar 85 p 5]

SPACE HARDWARE DEVELOPED--The Space Applications Centre (Ahmedabad) of the Indian Space Research Organisation has been carrying out system studies, hardware development, installation and check out, and technology transfer on satellite communication (Satcom) earth stations for more than a decade. The range of hardware developed/expertise acquired includes: 1.4m, 3m, 4.5m, 6.1m, 10.7m, 14m antennas with --aluminium panel/fibre glass reflectors, --Cassegrain/prime focus feeds, --manual/auto/programme tracking, 4 GHz FET low noise amplifiers, Up and down converters, 6GHz power amplifiers 20W, 400W and 3KW, FM modulators/demodulators for voice/low bit rate data, Wide band TV modulators/demodulators, Power supply systems, System engineering. ISRO is willing to consider technology transfer of satcom earth station hardware to industries in the public and large/medium private sectors with good infrastructure and experience in electronics. In addition to technology transfer, system engineering consultancy for satcom earth stations can also be provided. [Text] [Madras THE HINDU in ENglish 20 Mar 85 p 19]

PLANNED NEW EXCHANGES--Under the Government's plan for expansion of the telephone system in Delhi, 15 exchanges covering 1,70,700 lines will be commissioned within the next three years. This was disclosed by the Minister of State for Communications Ram Niwas Mirdha on Monday in a written reply to an unstarred question by Rajya Sabha member Mrs Krishna Kaul. The list of exchanges expected to be commissioned in the next three years and the number of lines at each exchange are Idgah (10,000), Nehru Place (30,000), Karol Bagh (10,000). Kidwai Bhavan (10,000), Rajouri Garden (30,000), Tis Hazari (10,000), Okhla (10,000), Shakti Nagar (20,000), Lakshmi Nagar (20,000), Shahdara (5000), Ghaziabad (8000), Shahdara East (3000), Janakpuri (2,100), Delhi Cantt (600) and Badarpur (2,000). In a written reply to an unstarred question by Lok Sabha MP Kamal Nath, Minister for Works and Housing Abdul Gafoor said on Monday that the DDA had served notices and passed demolition orders in 60 cases of unauthorised construction at Vikas Marg in Shakarpur, Lakshmi Nagar areas of East Delhi and also launched prosecution in criminal courts in 25 other cases. [Text] [New Delhi PATRIOT in English 26 Mar 85 p 3]

COMMUNICATIONS MINISTER TELLS PHONE SERVICE PLANS--New Delhi, March 18 (UNI)--The government has decided to go in for sophisticated digital telephone system, the communications minister, Mr. R. N. Mirdha, told the Rajya Sabha today. He said the digital technology was now being imported. A factory for manufacture of equipment for five lakh lines of digital system had been set up in Gonda, Uttar Pradesh. Mr Mirdha admitted that research and development in the telecommunication field had not progressed to the extent of evolving a digital system. Mr Mirdha was replying to supplementaries arising out of Mr Nepaldev Bhattacharjee's question of replacement of telephone lines in Calcutta. Mr Mirdha said in Calcutta, 63, lines, which had served for 25 years, needed immediate replacement. Of these, replacement of 50,700 lines was underway and installation of equipment would be completed within the next two or three years. Replacement equipment for the remaining 13,000 lines would be allotted and commissioned during the Seventh Plan. He denied any discrimination against Calcutta in the matter of improvement of the telephone system. The improvement plan for Calcutta Telephones during the Seventh Plan included installation of 21,060 digital microwave channels. The improvement plan would be implemented subject to availability of resources. [Text] [Calcutta THE TELEGRAPH in English 19 Mar 85 p 5]

CSO: 5550/0059

PAKISTAN'S OWN SATELLITE: CAPABILITIES DISCUSSED

Karachi DAWN in English 5 Apr 85 Magazine p II

[Article by Azim Kidwai]

[Text]

In this age of science, there are no crystal balls to gaze at the future; but by talking to people at the centre stage of important areas and reading between the lines, one can make a good guess at what is coming.'

By listening to almost a two-hour presentation made by the high-powered team rom NASA (National Aeronautical Space Administration) of the USA in Karachi recently and to some of the very cogent concluding remarks by Mr Salim Mehmud, Chairman, SUPARCO, followed by discussions with those present, the hunch was inescapable that Pakistan is to put into orbit more than one satellite on its own in a few years' time.

The odds are not stacked so high againt Pakistan as we thought, thanks to the US Shuttle, the reusable space craft, coming of age.

May be, even before the much talked about PAKSAT, the communication satellite (36,000km up in synchronous orbit) is whirling in space, Pakistan could find it possible to push one or two low-orbit satellites on its own as did India to begin with.

We have good reasons to talk on such a wavelength.

The 4-member NASA team led by Mr Donald D. Teague, NASA Customer Services Manager, had come to Pakistan in the third week of March primarily to promote collaboration between the two countries. The underlying purpose was to help Pakistan launch its satellites. NASA's capability in the field of launching satellites has, of late, increased very considerably due to the success of the Shuttle.

Shuttle

Shuttle is not only a reusable satellite as many uninitiated are led to believe, it is also a very effective launcher for other smaller satellites. It takes such satellites in its bosom along with other cargo and scientific experiments, and releases those satellites in space so that they can find their way to the required orbit.

So far the Shuttle has been mostly taking the communication satellites and has put them in synchronous orbit (synchronous with the rotation of the earth; time 24 hours). Thirteen communication satellites have so far been launched by the Shuttles in that high orbit, 36,000km from earth.

An easier job for the Shuttle but is to launch low orbit satellites that go round the earth only a few hundred kilometres up in space.

While to build and launch a communication satellite in the very high orbit is beyond the capability of the developing countries at present, smaller and less complex satellites for low orbit can be designed and built by countries like Pakistan. Their cost is not very high and launching through Shuttle easier. The venture can perhaps be made feasible earlier than the communication satellite.

The NASA team signed a draft

memorandum of understanding with the SUPARCO Chairman that envisages, apart from launching the PAKSAT, collaboration in a much wider field.

When we asked Mr Teague after his presentation was over as to what may be the cost of launching the PAKSAT, he indicated the approxmate figure of 20 million dollars (that is, rupees 300 million).

The satellite that will have to be fabricated abroad may itself cost, say, 40 million dollars. The total bill, include—insurance etc., could be Rs. 1,200 million. Two PAKSATs (the other as backup unit) may entail a bill of 2,500 million. Of course, these figures are not exact, but they do give some idea of the quantum of money involved in such ventures.

In the strait economic jacket we are supposed to be in at present, the project may not get the green signal early.

In such a situation, SUPARCO may find it a more feasible proposition to put a satellite or two in low orbits earlier than PAKSAT, the cost of such a project being only a fraction of the PAKSAT project.

NASA may be too happy to release such low-orbit satellites for Pakistan through Shuttle that can do the job on its way to its own orbit.

The NASA team has offered to SUPARCO collaboration in other aeas as well.

For the last 10 years, SUPARCO has been getting pictures from LANDSAT satellites as a result of collaboration with NASA, and 50 different agencies in Pakistan have been using these pictures to maximize resources from the earth.

At present the pictures received from remote sensing satellites are analysed and interpreted by SUPARCO, and the information deciphered is given over to the user agencies. A few significant ones out of about two scores of studies carried out by SUPARCO are:

Study of water-logging and salinity; snow survey of mountains in winter for estimation of likely flow in rivers in subsequent seasons; mapping of areas under floods and determining of weak spots that give way on the banks; mineral resources survey; cotton crop estimation and pest infestation; identification of crops and thereby estimation of acreage of crops; estimation of siltation in reservior areas of Tarbela and Mangla Dams; monitoring of desertification in Cholistan area.

Another area of collaboration is in monitoring the earthquakes. If you have a LASER station on the ground, a LASER beam can go to a very high density, precisely positioned satellite into space and back. Micromovements of earth of tectonic nature thus monitored can facilitate earthquake predictions.

Zero gravity

Pakistan may also get a small space in the Shuttle to set up its experiments in zero gravity conditions. They could be a good R&D programme for SUPARCO. NASA for instance, casts perfect spheres in the Shuttle in zero gravity conditions. An example is that perfect ball bearings can be thus cast and can be sold at exhorbitant price because no perfect sphere can be cast on earth due to pull of the gravity.

A spin-off from the draft memorandum signed may be that a Pakistani astronaut may be accommodated in the Shuttle. NASA has agreed that if it launches the Pakistani satellite, a Pakistani astronaut on board the Shuttle is to be part of the deal. Of course, he will have to have exhaustive training before he goes into space.

We asked the leader of the NASA team as to how the launching of a satellite by Shuttle compares with other launching systems like the US multi-rocket configurations or even the rocket systems of the European Space Agency. He said that that the Shuttle compares well as a launcher, cost-wise. He but underlined the point that there are other facilities appended to launching by the Shuttle such as an astronaut also going on board the Shuttle along with the cargo satellite to be launched.

Such a valuable experience is not possible with other launching systems. No man or astronaut is blasted off in such rocket systems. They only launch the satellites.

CSO: 5500/4727

REPORTAGE ON PANA MEETING IN ADDIS

Mengistu Message

Addis Ababa THE ETHIOPIAN HERALD in English 28 Mar 85 pp 1, 3

[Text]

Comrade Mengistu Haile-Mariam, General Secretary of the CC of WPE, Chairman of the PMAC and Commander-in-Chief of the Revolutionary Armed Forces, yesterday said that Pan-African News Agency (PANA) should become an effective medium to help the peoples of Africa to know more about each other and to consolidate their solidarity.

Comrade Mengistu made the statement in a message to the third session of the conference of African Ministers of Information of the Organisation of African Unity (OAU) which opened at Africa Hall yesterday. The message was read to the conference by Comrade Feleke Gedle-Giorgis, member of the CC of WPE and Minister of Information and National Guidance.

In his message to the four-day conference, Comrade Mengistu expressed fervent hope that the conference would create conductive conditions which would enable PANA to become a workable news agency.

The Agency, he said, should serve as an instrument of widespread diffusion of science and technology throughout the continent and could also make an effective contribution for the emancipation of compatriots languishing under the tyrannical rule of the atrocious apartheid regime.

"PANA can also perform an invaluable task by presenting to the world community the true image and the objective picture of the efforts, struggle and opinions of the peoples and governments of Africa," Comrade Mengistu said.

Stressing the economic problems facing the continent, Comrade Mengistu noted that Africa had been hit by the most devastating drought, as a result of which some 24 African countries have been rendered unable to produce food crops or to purchase food from abroad and have thus become recipients of relief aid.

After stating that some 150 million of African compatriots are exposed to hunger and disaster, Comrade Mengistu said that, while Africa needs emergency foreign relief assistance to

withstand the disaster, the ultimate responsibility for the long-term and lasting solution to the problem falls on the shoulders of Africans themselves.

Comrade Mengistu stressed that it is necessary, indeed essential, to carry out extensive educational campaigns to encourage and inspire the peoples of Africa to lift up their hands in unison and with resolve so that Africa may become self-sefficient in food, so that they strive with resolve and determination for development and progress, and do away with the underdevelopment which shackles them to mass poverty and destitution.

He said that the struggle for the establishment of a new information order is part and parcel of the struggle for a new economic order.

"The contribution that we Africans make for the on-going struggle of the oppressed and exploited peoples of the world will be measured not only by the concrete steps we take to develop and strengthen the mass media in our individual countries but also by the tangible steps we take to build competent and efficient continental mass media organs and agencies," noted Comrade Mengistu, adding that the cooperation of all OAU member states is essential if PANA is to be a viable news agency under the leadership of competent and dedicated Africans, fully backed by skilled manpower and solid infrastructure.

"We also hope that during your deliberations here you will hold fruitful exchange of views on how the mass media organs in our continent beyond the tasks they perform for the development of their countries, can make concerted and effective contribution for the enhancement of the brotherhood and solidarity of the African peoples, for their development and prosperity and for stability and peace," Comrade Mengistu said.

Addressing the conference Comrade Feleke Gedle-Giorgis, the out-going Chairman of the conference, said that the Pan-African News Agency was launched six years ago in line with the decisions and recommendations of the second session of the Council of African Ministers of Information.

He recalled that PANA was recommended as an African institution of information by the founding fathers of the OAU 22 years ago so as to rectify "the lack of information media in various parts of the African continent" and in view of "the necessity of strengthening ... exchange of information among African states in order to promote better understanding amongst their peoples".

Comrade Feleke further stated that the PANA conference is taking place at a time when the economic and social conditions in Africa are becoming increasingly grave. He pointed out the problems of drought, famine, social dislocation, economic stagnation, declining food production, soaring external debt and other obstacles. He said: "At least 34 countries are suffering from the effects of severe climatic and ecological changes, some 24 African countries are most grievously hit by drought. It is estimated that 150 million Africans in 34 countries face starvation this year." Comrade Feleke added that the current Chairman of the O A U, President Mwalimu Julius Nyerere of Tanzania, has launched an appeal for a special fund for the African countries hit by drought.

Explaining the aims of the ministers' conference, Comrade Feleke said African countries must review their

co-operation in the field of information and communication, must relate the area of their mandate to the present reality and try to offset their weaknesses by their collective strength.

He stressed that they must enhance their co-operation, solidarity and unity through their continental medium — PANA — to which they should give their total support so that it becomes a functioning and effective News Agency.

The decolonization of information and communication cannot be seen apart from decolonization in the realm of politics and economics, stated Comrade Feleke.

Equally, Comrade Feleke pointed out, the call for a new world information and communication order continues to receive the hostile reaction of the media transnationals and the press organs of some western countries.

Reviewing the possesion of the weapons of information media of the developing countries that represent 70 per cent of the world's population, Comrade Feleke said that they command only 22 per cent of book titles published, 17 per cent of total newspapers circulation, 9 per cent of news print consumption, 27 per cent of radio transmitters, 18 per cent of radio receivers, 5 per cent of television transmitters and 12 per cent of television receivers.

"And so the most effective response to the onslaught of media imperialism lies in establishing our own media infrastructure, and in strengthening PANA and the news agency pool of the non-aligned countries," Comrade Feleke noted.

Comrade Feleke said that the current conference of ministers' of information will respond to the problems and challenges facing all Africa in these trying days so that the information and media services of the OAU member states will play a constructive role in the service of African peoples and for their regeneration.

Speaking on behalf of the delegations, the Tanzanian Minister of Information expressed gratitude for the constructive advise contained in Comrade Mengistu's message to the conference praising it as a reliable source of information dwelling on the objective reality of the continent, revealing the present and future information feature of the region and the measures that must be taken to improve the fields of information.

Dr. Peter Onu, Secretary General of the OAU a.i., said that the information media could play an important role in overcoming the problems prevailing over Africa as Comrade Mengistu Haile-Mariam has fittingly put it in his message and further noted that the information media could greatly contribute towards the proper implementation of the development strategies adopted by the Lagos Plan of Action.

Dr. Peter Onu stressed that Africans must struggle to liberate their information media from the domination of the information monopolies and must realize the fact that nobody but themselves could disseminate accurately the news about their people, communities and their political issues.

A representative of UNESCO spoke on behalf of the Director General of UNESCO and pledged that his organization will continue to strengthen its relations with the continent in the field of information.

Later elected as bureau members were Mr. Safwat El-Cherif, the Minister of Information of Egypt, as Chairman, Mr. Mohammed Traore. Infor-

mation Minister of Guinea, First Vice-Chairman, the Minister of Kenya and Zambia second and third Vice-Chairmen respectively, while that of Cameroun was elected as rapporteur.

The conference later adopted the agenda which was drafted for the inter-governmental council's third extraordinary session.

Meanwhile, ministers of three countries arrived here yesterday to attend the third session of the OAU Conference of African Ministers of Information.

They are Mr. Suomaila Mahmat and Mr. Daoula Diallo, Ministers of Information of Chad and Niger respectively, and Mr. Houdou Ali, Minister of Information and Communications of Benin.

The Ministers were welcomed on arrival at Bole International Airport by heads of departments of the Ministry of Information and National Guidance.

Progress Report

Addis Ababa THE ETHIOPIAN HERALD in English 29 Mar 85 pp 1, 6

[Text]

Comrade Lucio Lara, member of the Politburo of the Workers Party of the MPLA of Angola, Secretary for Organizational Affairs of the Party Central Committee and Chairman of the Inter-Governmental Council of PANA, yesterday submitted to the PANA conference the progress report on the activities of the Inter-Governmental Council (IGC).

Comrade Lara, outlining the achievements of PANA, said that the agency has since 25 May 1983 become "a living reality" and a medium through which countries on the continent exchange news daily, making Africa's voice heard in the world, especially in the pool of news agencies of non-aligned countries. He noted that PANA has prepared, for adoption, its five-year development plan covering the 1986-1990 period.

This plan is expected to make PANA a major international news agency endowed with a data bank that will make information available to the African media, a photographic service and various news services equipped with modern facilities for producing features and special reports and for selecting news items from international news agencies, Comrade Lara reported.

The report covers the pilot phase of PANA from 1979 to 1982 and its operational phase from 1982 up to the present.

The inadequacy of financial resources, which depend on contributions from member states, Comrade Lara declared, has not made it possible up to now to recruit staff on permanent basis, and to undertake the extension of the agency's telecommunications network so as to cover all member states.

The deep sense of responsibility and the consciousness of the members of the IGC has made it possible for the

agency to continue its activities despite the problems facing the Organization of African Unity, Comrade Lara said, adding that it is left to the conference to pronounce itself now on the various decisions taken by the IGC at its sessions.

In a report to the PANA session Wednesday, Dr. Peter Onu stressed that the year 2000 is only fifteen years away, and that there is a lot of work to be done.

Dr. Onu said: "The way to the future of Africa is clear: individual and collective self-reliance in all fields of endeavour, including the effective use of communications and mass media in this continent".

Dr. Onu reiterated that the importance of PANA cannot be overemphasized, because it is both useful and vital to the individual and collective efforts at increased cooperation in the field of information. He urged those member states that have not signed the convention to do so as soon as possible.

Dr. Onu said that PANA has been established but that it was not given the wherewithal to flourish.

He told the delegates:

"I wish to reiterate in conclusion that indeed you do have a pivotal role to play in these next 15 years, to the year 2000. Your efforts individual and collective will determine to a great extent, the realization of our ultimate objectives and the creation of Africa of our dreams. It can be done. It must be done."

Meanwhile Mr. Cheick Ousmane Diallo, the current Director of PANA, gave a progress report during the afternoon's closed session.

New Council Elected

Addis Ababa THE ETHIOPIAN HERALD in English 30 Mar 85 p 1

[Text]

The Third Ordinary Conference of the Information Ministers of OAU member States yesterday elected a new Inter-Governmental Council of the Pan-African News Agency (PANA), which will oversee the smooth running of the Agency for the next two years.

Those elected are: Algeria and Tunisia from the north; Djibouti, Somalia and Tanzania from the east; Benin, Gambia, Liberia and Niger from the west; Burundi, Cameroon and Gabon from central Africa; Zimbabwe and Mozambique from the south.

The ministers also agreed to hold their Fourth Ordinary Conference in Addis Ababa in March, 1987. It was also reported that the Council will meet in an extra-ordinary session in Cairo in November this year to elect the director general of PANA.

Earlier in the day, the Conference exhaustively discussed three documents prepared by the OAU Secretariat dealing with the role of information in the implementation of the Lagos Plan of Action, Africa and the new world information order, Afro-Arab co-operation in the field of information. It was emphasized that as this year's OAU summit in Addis Ababa will be devoted to economic

matters, the mass media in Africa should give due attention to the Lagos Plan of Action.

The Conference of African Information Ministers is scheduled to conclude its four days of deliberations today afternoon at Africa Hall with the adoption of a series of draft resolutions on facilitating the work of PANA and strengthening intra-African cooperation in the field of information.

CSO: 5500/134

GHANA

GDR TELECOMMUNICATIONS TEAM ARRIVES IN ACCRA

AB172120 Accra Domestic Service in English 1800 GMT 17 Apr 85

[Text] A 5-man telecommunications team from the German Democratic Republic now in the country, today called on the director general of the Post and Telecommunications Corporation, Lieutenant Colonel Christina Debrah in Accra. Their discussions centered on rural telecommunications. The leader of the delegation, Mr (Steinberg Eckrat) praised the importance of rural telecommunications in the national development effort. He said: Since the wealth of the country is generated mostly from the rural areas, it is important that they be adequately catered for by way of telecommunications. Mr (Eckrat) briefed the director general of what the GDR is capable of providing in this respect and said that country has had useful discussions on the installation of rural telecommunications in [names indistinct] Cameroon, Algeria, and (?Mexico) [passage indistinct]

On her part, Colonel Debrah said the government is aware of the importance of telecommunications in the national economic recovery program and is sparing no effort to assist the corporation. She referred to a number of development projects which the corporation has embarked upon and said when completed, they will bring a vast improvement to the country's telecommunications services.

CSO: 5500/132

SOUTH AFRICA

IDC-SIEMENS INTEGRATED CIRCUIT VENTURE REPORTED

Johannesburg THE STAR in English 2 Apr 85 p 23

[Text] The R60 million integrated circuit manufacturing venture launched jointly by the Industrial Development Corporation (IDC) and Siemens has been handed over entirely to private enterprise.

The company, SA Micro-Electronic Systems (Sames), of Koedoespoort, Pretoria, has been restructured with the seven major South African electronics companies in the country having a shareholding, while the IDC has withdrawn, having sold its 51 percent shareholding.

Companies now directly participating in the company are: Altech (35 percent), Siemens (25 percent), Reunert (15 percent), Plessey (12 percent), Telephone Manufacturers (10 percent), Federale Volksbeleggings (2 percent) and Grinaker Electronic Holdings (1 percent).

The restructuring is retrospective with effect from October 1 last year.

The company, which made a profit for the first time last year, had a turnover that year of R16 million, of which 8 percent was accounted for by exports. It is projecting to increase turnover to about R25 million this year.

It was also disclosed that Sames is already bringing into operation plans to broaden its base of operation. With sister company, the Integrated Circuit Design Centre (ICDC), the design and marketing arm of the operation, it will provide "application specific" integrated circuits for the electronic industry. This involves substantial development of design facilities at ICDC, which depends heavily on overseas-generated designs, mainly for telecom.

CSO: 5500/129

REPORT DETAILS SABC POLICY

Johannesburg THE CITIZEN in English 20 Apr 85 p 10

[Text]

CAPE TOWN — The SABC would not allow itself to be used as a propaganda platform for people and groups which had "defined themselves out of democratic processes and preach violence and revolution," the corporation said in its 1984 report, tabled in Parliament yesterday.

The report said that with the new political developments that took place last year, it submitted itself to "penetrating self-analysis" to determine whether it was keeping audiences properly informed.

"With specific regard to internal unrest, the news division adopted the standpoint that, in the interests of informed public opinion, the public should be kept informed factually about all incidents of any significance.

"At the same time it has been scrupulous in striving to deal with events in such a manner that the SABC would in no way become a propaganda platform for radical groups overtly inciting violence and revolution."

"In addition the news division has moved towards establishing itself more firmly as a forum for debate among the country's various communities."

Radical elements had "refined their techniques for exploiting television's flair for action and drama to a fine art in their effort to make the headlines with their extra-Parliamentary radical propaganda."

In the face of this, the SABC had decided to "present the information without giving free rein to the medium's capacity for action and drama."

"Television news accordingly fulfilled its informative duty by presenting the central facts about unrest, terrorist incidents, racial trends, and so forth but tried to avoid falling victim to becoming an agent for radicalism in the process, by reporting soberly and factually.

"When appropriate, television news called for the view of the silent majority, who, while also critical of the South African set-up, are sick and tired of the disruption caused by terrorism, intimidation, unrest at schools and the like."

TV2 and 3 had played a "key role" in the unrest by "calming down feeling by means of a sober and balanced approach." — Sapa.

CSO: 5500/133

SOUTH AFRICA

BRIEFS

SATELLITE SERVICE--The SABC is to make use of international satellite technology to facilitate radio and television transmission to the rural areas of South Africa. These areas and Walvis Bay are to be served with one TV and five radio channels by the middle of next year, Mr Riaan Eksteen, director general of the SABC, announced yesterday. He said the SABC and the Department of Post and Telecommunications, had drawn up an agreement with the international organisation Intelsat for the hire of a transponder. Hire of the satellite service would cost about R3,07 million, and would enable SABC to relay TV1 and five radio channels to a number of transmitting stations throughout the country.--Sapa. [Text] [Johannesburg THE CITIZEN in English 19 Apr 85 p 13]

CSO: 5500/133

USSR

MINERALNYYE VODY RECEIVES NEWSPAPERS BY SATELLITE

PM130822 Moscow TRUD in Russian 6 Nov 84 p 4

[A. Movchan report: "Newspaper Via Satellite"]

[Text] Mineralnyye Vody--Photocopies of pages of all the central newspapers, including TRUD, have begun being transmitted to Mineralnyye Vody via the Statsionar-5 communications satellite and the Moskva system.

Many collectives of the USSR Communications Ministry system worked to make this happen. Mineralnyye Vody communications workers also did a large share of the work. Photo-telegraph engineers Ye. Mukovnikova, A. Mashchenko, and N. Kunitsyna and senior electrical engineer N. Yereshkin set up, adjusted, and regulated the antennas and the receivers of the Moskva system equipment.

Previously, photocopies of central newspapers were sent from Moscow to Mineralnyye Vody along cable communications channels.

It used to happen that the publication of a newpaper's latest issue was delayed because of interference on the line. To top it off, in order to send a newspaper along communication cable lines it was necessary to take up 60 channels, along which subscribers could have held additional intercity conversations. Now these channels are being freed. In addition, the transmission of newspaper pages increases the reliability of publications of a newspaper's latest issue.

CSO: 5500/1013

USSR

NEW RADIO-TV TOWER COMMISSIONED IN KAZAKHSTAN

PM091606 Moscow KRASNAYA ZVEZDA in Russian 8 Nov 84 Second Edition p 4

[Major S. Dorokhov report: "Man-Made Peak at Alatau"]

[Excerpts] A new radio and TV tower has been commissioned in Kazakhstan's capital, which will make it possible to transmit broadcasts on four radio and six TV channels. The glistening, 372-meter aluminum edifice towers over Alma-Ata.

The operational radius of the new radio and TV tower is approximately 120 km. This means that the number of inhabitants of Kazakhstan who can watch TV broadcasts, listen to the radio, and sense the pulse of the motherland will increase considerably.

CSO: 5500/1013

USSR

TELEVISION STATIONS INTERFERING WITH EACH OTHER

[Editorial Report] Baku KOMMUNIST in Azerbaijani on 20 December 1984 carries on page 4 an 1,100-word summary of readers' complaints on the technical quality of television broadcasts, especially in mountainous regions. "In their letters viewers are complaining about the poor quality of broadcasts and interference. One must note that 12 television stations working with a 'meter's' range are interfering with each other, especially in the summer months. The low technical quality is often due to the incompetence of television transmission center workers." The availability of the all-Union Second Program is also discussed. By 1983-1984 only Baku, Kirovabad, Guba, Ali Bayramly, Pushkin, Jalilabad, Lankeran and Lerik Rayons were equipped to receive it. It is noted that the entire republic will be able to receive it by 1990.

CSO: 5500/1018

BRIEFS

AUTOMATED LONG DISTANCE SERVICE--Matthias Bjarnason, telecommunications minister, has asked the Postal and Telephone Agency to establish a completely automated long-distance service. The long-distance service will be part of the new general phone network, and will include automobile, boat and ship-to-shore service, as well as connections with summer cottages and several isolated regions. It is intended that this new service will begin around next year and will reach to nearly all areas of the country by the end of 1987. This phone network is the same as has now been in use for several years in the other Nordic countries. [Text] [Reykjavik MORGUNBLADID in Icelandic 14 Apr 85 p 2]

CSO: 5500/2631

ITALY

TELETTRA'S HIGH-CAPACITY INTEGRATED DIGITAL NETWORK

Milan RIVISTA TELETTRA in Italian Oct 84 pp 3-23

[Article by M. Nannicini; M. Salerno, of GTE Telecomunicazioni, Laboratorio Ponti Radio, Cassina de' Pecchi (MI); and L. Vismara: "HTN-6u High-Capacity Digital Microwave System (140 Mbits/Sec)"]

[Text] The 6-GHz digital transceiver and the 16 QAM 140-Mbits/sec modem described in this article are the first products of a new generation of equipment designed to replace the present high-capacity analog systems in the ambit of modern integrated digital networks.

New circuitry solutions have made it possible to address the problems of distortion in connection with the use of 16 QAM modulation.

In particular, the use of space diversity with IF [intermediate-frequency] combiner, of adaptive equalizers at intermediate frequencies, and of adaptive equalizers at base band has made it possible to combat effectively the adverse effect of selective fading and to operate well within the limits specified by the CCIR for meeting annual service-outage criteria.

Introduction

The HTN-6u transceiver and relative CMF-40 modem were designed for use in major radio trunk systems. Their transmitting capacity is 1,920 PCM [pulse-code modulation] channels.

The most significant characteristics of the system may be summarized as follows:

--The equipment is subdivided into functional, easily removable, modules mounted on a "slim" rack;

--The transceiver in its two basic configurations, single-receiver or space diversity, occupies the entire rack;

--The modem rack can be equipped with either one modem plus bit-insertion and bit-extraction panels, or with two repeater-associated modems;

--Power consumption of the transceiver, under maximum equipment conditions, is less than 100 watts, while a terminal-station modem consumes 70 watts;

--The receiver is in all cases equipped with a low-noise-factor RF [radio-frequency] preamplifier, and the receive converter unit contains a local AGC [automatic gain control] circuit capable of counteracting the phenomena of exceptional rises in RF signal strength in cases of special propagation conditions;

--The transmit converter is provided with an IF predistortion network capable of compensating the third-order distortion of the power amplifier;

--The transmitter can be equipped with a solid-state amplifier having a saturation-power rating of approximately 4 watts, or, alternatively and with perfect interchangeability, with a TWT [traveling-wave tube] amplifier optimized for digital service.

Of particular interest in this system is the use of some circuits designed to counteract selective fading. These circuits are as follows:

--IF mixer, used in links utilizing space diversity for reception;

--Adaptive equalizer of slope and parabola, which can be physically allocated either in the receiver or the demodulator, and whose effect in terms of improving the "service-outage" factor is substantial in the case of single-receiver reception;

--Baseband transverse equalizer, with "forward" and "feedback" taps, and that is capable of counteracting multiple-path fading in both the minimum- and nonminimum-phase cases; the latter equalizer plays a particularly important role among the countermeasures used.[1],[2],[3]

Mechanical Structure and Maintenance

The mechanical structure, which is still that of the previous analog generations, utilizes "slim" racks measuring 120 mm wide, 225 mm deep and 2,600 mm high.

The receiver section of the rack accommodates 54-mm modules mounted side-by-side (Figs 1 and 2 [Fig 2 not reproduced here]).

The branching units are located partly in the upper region of the rack and partly in the lower region. This branching arrangement necessitates the use of a waveguide downlead external to the rack; a single downlead is used also in the multiple-radio-channel system configuration. Besides, this makes for easier accessibility also in the case, a frequent one, of diversity receivers.

The radio rack is equipped with two power supplies, one of which feeds the transmitter (except the power amplifier) and the other the receiver; however, either of the two supplies can carry the total load of a transceiver. The power amplifier module--the solid-state one as well as the TWT one--has its own power supply which operates directly on the primary line voltage.

In the design of the modules, maintenance requirements were taken into account, developing, where possible, components covering full bandwidths and easily interchanged without the need for complicated fine adjustments.

The Tx [transmit] and Rx [receive] converters are wide-band units, except for the local oscillators (although these are identical and interchangeable among themselves) and the microwave filters, which are obviously tuned frequency by frequency.

The solid-state power amplifier, owing to the high performance required of it, is instead subdivided into two sub-bands, the first from 6,425 to 6,775 MHz, and the second from 6,765 to 7,125 MHz.

As an alternative, a module with TWT amplifier, which is fully substitutable for the solid-state amplifier module, is provided; in this case the bandwidth coverage is total. The IF amplifier module is the same for all the radio channels and is designed to accept an adaptive equalizer of amplitude (optional) at its output.

Alongside the IF amplifier module (Fig 1) is the microprocessor module, which is used with the space-diversity receiver and IF combiner; this module controls the phase shifter in the secondary mixer module.

As is customary, as regards maintenance and remote supervision, each module provides a visual alarm signal on its front panel, electronic locking at its terminal board (adjusted for remote alarm signaling), and a general alarm signal which, besides activating an LED (light-emitting diode) on the control panel, triggers the lighting of the red alarm lamp located at the top end of the rack; buffer storage of alarm signals can also be provided. All manual presets trigger remote alarms as well as the lighting of a yellow LED on the module involved and of the yellow signal lamp at the top of the rack.

Monitoring is done by comparator at the qualitative level of the HTN-6u system. Most of the significant levels can be measured using the control-panel-mounted meter and related metering patch cord (see Fig 3 [not reproduced here]).

Technical Characteristics

General

- RF band: 6.4-7.1 GHz.
- Channeling: CCIR Rec. 384-2.

Transmitting Capacity

- Principal signal at 139.264 Mbits/sec, equivalent to 1,920 PCM channels for telephone traffic.
- Auxiliary signal at 2,048 Mbits/sec, equivalent to 30 PCM channels for terminal-to-terminal traffic.
- Signal at 704 kbits/sec for 10 PCM service channels, and supervision signal at 64 kbits/sec, both being available at the terminal and at the repeater.

RF Characteristics

- Average power transmitted at the output of the branching filter: +28.5 dBm (solid state); +32 dBm (TWT) (typical values).
- Noise factor (for a level of -45 dBm at the input to the branching filter): 5 dB.
- Frequency stability of the transmitter and receiver: ±30 ppm (5-40°C, CEPT).

IF Characteristics

- Intermediate frequency: 140 MHz.
- Interconnection impedance: 75 ohms.
- Reflection loss: ≧26dB in the 140±20 MHz band.
- Input level of transmitter and demodulator: -3 dBm.
- Output level of receiver and modulator: -3 dBm.
- Receiver threshold for BER [bit-error rate] = 10^{-3}: -73 dBm.

Modem

- Modulation: 16 QAM.
- Demodulation: Coherent.
- Carrier frequency: 140 MHz.
- Modulator stability: ±15 ppm.
- Modulator output level: -3 dBm.
- Demodulator input level: -3 dBm (+1/-5 dB).
- IF impedance: 75 ohms (unbalanced).
- Reflection loss: ≧24 dB (140±25 MHz).
- S/N [signal/noise] for BER=10^{-4} in IF loop: 21 dB (typical).

Base Band Characteristics

- Principal signal: 139.264 Mbits/sec.
- Auxiliary signal: 2,048 kbits/sec.
- Digital service channels: 704 kbits/sec.
- DSI [digital switching instructions] for multilineal protection: 64 kbits/sec.

Interfaces

- Principal signal: To CMI terminal (CCITT Rec. G. 703), to NRZ [Non-Return-to-Zero repeater and CLOCK.

- Auxiliary signal: HDB3 (CCITT Rec. G. 703).
- Digital service channel: NRZ and CLOCK.
- DSI: NRZ and CLOCK.

Frame

- Aggregate frequency: 143.360 Mbits/sec.
- Frame frequency: 64 kbits/sec.
- Frame length: 2,240 bits.
- Number of sectors: 7.
- Frame alignment word: To terminal, 14 bits; to repeater, 8 bits.
- Frame alignment time: To terminal, 54.78 μs [microseconds]; to repeater, 285 μs.

Power Supply

- Supply voltage: From -20.4 to -72 V. D.C.
- Power absorbed by modem: To terminal, 70 W; to repeater (bidirectional), 75 W.
- Power absorbed by transceiver: To terminal in single-receiver configuration, 78 W.; to terminal in diversity configuration, 95 W.

Transceiver

Channeling is as shown in Fig 4 (CCITT Rec. 384-2).

In the HTN-6u system, with a dually polarized antenna, 7 radio channels can be transmitted: Channels 8 and 1', which are separated by 60 MHz, cannot be coupled.

The allocation of LO's [local oscillators] is as follows:

- Upper, for radio channels 1 to 8.
- Lower, for radio channels 1' to 8'.

This solution is advantageous in that it makes it possible to:

- Reduce to a minimum the frequency band that must be covered by the LO;
- Avoid having the Channel 1 (1') frequency matching the image frequency of Channel 8 (8') and vice versa, and also to avoid spurious at 20 MHz generated by beating between the third and fourth harmonics of the LO's (1 with 7, 2 with 8, 1' with 7', and 2 with 8'), as would occur in the event the LO crossover were selected within each half-band.

  The design of the branching filters is based on the technique of the dual-mode resonant cavity[4], which has yielded excellent results with respect to group delay and stability versus temperature, as well as a substantial reduction in size.

The transceiver consists of the following modules:

- Transmit converter;
- Power amplifier;
- Receive converter;
- Transmit branching;
- Receive branching;
- IF amplifier;
- Microprocessor.

Fig 5 shows the block diagram of the transmitter, while Figs 6 and 7 show, respectively, the block diagrams of the receiver in the single-receiver configuration and of the receiver in the space diversity configuration.

Transmit Converter Module

This module contains the IF pre-emphasis circuit, the up-converter (in which the IF signal amplifier is integrated), the local oscillator and the conversion filter.

The microwave circuit is designed in balanced-mixer configuration, using two Schottky diodes in which the microwave signal from the LO is beat against the 140-MHz signal.

A 3-cavity wave-guide bandpass filter selects the sideband to be transmitted.

The IF amplifier that drives the converter diodes is of thick-film design, and provides for regulation of gain to recover the dispersion owing to conversion losses.

Based on the need for a high degree of linearity of the converter, the LO level is +15 dBm, thus guaranteeing an up-converter intercept point of approximately +14 dBm.

The design of the local oscillator is based on the model with inert-gas-filled, sealed and temperature-compensated shunt cavity; the active component is a medium-power FET [field-effect transistor] in "reverse channel" configuration.(5)

A directional coupler is provided in the RF portion of the oscillator for frequency and level measurements. The transmit oscillator is entirely identical to the one used in the receive side. The transmit converter module is shown in Fig 8 [not reproduced here].

Power Amplifier Module

This module contains the TWT, its power supply circuit, and the output alarm coupler assembly.

The principal characteristics of the TWT amplifier are:

- Use of a TWT of the dual collector type with integrated focalizer, and characterized by long operating life (around 50,000 hours) and high reliability (MTBF [mean time between failures] around 100,000 hours);
- Overall efficiency of power supply tube and circuitry, above 25 percent;
- Need for only one regulated supply (grid voltage), thus simplifying maintenance operations.

The gain is at least 45 dB at an output power of approximately 2 W.

The manufacturer's guaranteed intercept point is at least +49 dBm (referred to total power with two tones).

The solid-state version of the amplifier, which is perfectly interchangeable with the TWT version, is constructed on "duroid" using microstrip technology; the active elements consist of GaAs FET's for medium and high powers, and the amplification stages are six in number.(6),(2)

The solid-state amplifier which is capable of delivering a saturation power of +36 dBm, is used with a "back off" of 6.5 dB, to permit linear operation with low intermodulation so as to diminish intersymbol distortion of the digital signal; third-order distortion at an output power of +29.5 dBm is around 35 dB.

To compensate the third-order intermodulation distortions introduced by the power amplifier, a pre-emphasis circuit was developed which, taking advantage of the nonlinear characteristic of a diode pair, generates third-order distortions that are manually regulatable in amplitude and phase so as to offset those owing to the amplifier.

Fig 9 [not reproduced here] shows the improvements introduced by the pre-emphasis circuit, which are borne out by two-tone intermodulation measurements.

Receive Converter Module (Fig 10 [not reproduced here])

This module contains the low-noise-factor microwave preamplifier with related band-stop filter at the output. The mixer is of the balanced type, of microstrip construction, using a rat-race type hybrid and a matched silicon diode pair.

The receive converter module contains also the IF preamplification circuits, which in the HTN-6u equipment are divided into one fixed-gain section (10 dB) and one variable-gain (local AGC) section with a maximum gain of 16 dB.

The IF variable-gain section is the one that makes it possible to achieve a low intermodulation factor in the receiver even in the case of reception of strong-signal fields.

As mentioned above, the local oscillator is perfectly identical to the one used on the transmit side of the system.

The receive converter module is available in three versions: The single-receiver version and the one for space diversity, main branch, contain the local oscillator; the version for space diversity, secondary branch, on the other hand, does not have a local oscillator (the latter type receives its signal from the LO of the main branch converter).

IF Amplifier Module

The amplification section is of thick-film construction, whereas the service circuits, which include the AGC and alarm-adjustment circuits, are of partly thick-film and partly printed-circuit construction.

In addition to noise-factor considerations, those relating to amplitude/frequency response with variations in gain received particular attention in the design.

The use of two-stage-feedback amplifiers and PIN-diode gain control enabled attainment of an amplitude/frequency response within 0.5 dB for 60 dB of gain control. The IF filter with group delay equalizer is comprised entirely of passive components. In this filter, in addition to its attenuation characteristic, its reflection characteristic, which normally is more difficult to attain, owing to the criticalness of its components, plays a very important part. The use of printed-circuit coil construction and of a special type of synthesis enabled the attainment of a better than 27-dB reflection loss throughout the usable bandwidth.

The attenuation and group delay characteristics of the filter are shown in Figs 11 and 12.

The active equalizer is of thick-film construction with particularly stable adjustments mounted externally on a printed circuit.

Particular attention was paid in the project to the AM/PM conversion and noise factor. This latter characteristic is highly important, since it contributes substantially to the determining of the receiver's overall noise factor.

An adaptive slope-and-parabola equalizer is provided, on request, at the output of the IF amplifier module, to correct the amplitude/frequency response in the case of distortion owing to selective fading.

The IF amplifier module is shown in Fig 13 (not reproduced here).

The photo shows the details of the amplification circuits with gain adjustment, formed on thick-film substrates, the IF filter, the AGC detector, and the IF amplifier with two outputs.

On the opposite side of the module is the service-circuits substrate with the AGC circuits, alarm circuits, and AGC voltage processing circuits.

A diode-type linearization network provides an indication, on the LED-diode-type meter, of the received field strength between -20 and -70 dBm, accurate within 2 dB.

Microprocessor Module

The microprocessor determines the combining strategy for maximum power in the case of space diversity reception. It contains an 8-bit, Type Z80, microprocessor, and performs the following functions:

- Receives information from the IF module's AGC circuit;
- Processes the command signal for the IF combiner circuit;
- Continually checks the validity of the command signals imparted, and changes the operative sense in the event of error;
- Under balanced conditions, optimizes the position of the phase shifter for maximum power output from the IF combiner;
- Operates in phase-steps of 3°, except during approach conditions when each step is 6°;
- Is programmed for self-testing.

By means of an external accessory, the necessary manual presetting can be done for the trouble-shooting of malfunctions and delay-equalization of the waveguide downlead runs.

16 QAM Modem CFM-40

Modulator Module

The 16 QAM modulator performs the following functions:

- Conversion of the 140-Mbits/sec data bit stream (f_b) to four 35-Mbits/sec streams ($f_b/4$);
- Differential encoding;
- Baseband filtering of the four 35-Mbits/sec binary bit streams;
- Conversion of the four binary signals to two (PAM) 4-level signals;
- Local generation of the 140-Mbits/sec bearer;
- Modulation of the two quadrature components of the said bearer and subsequent combining of those components to obtain the 16 QAM signal.

Fig 14 shows a simplified block diagram of the modulator.

Modulation on the two quadrature axes is of the AM type with carrier suppression; it is kept perfectly linear since the multilevel signals must be operated on while preserving the baseband-imparted spectral shaping.

Assuming overall channel shaping of the cosine-squared type (roll-off 50 percent) and a distribution between transmit and receive filtering such that the equivalent received noise bandwidth will be equal to the symbol frequency, the required transmit shaping is of the cosine type.

The foregoing transmit shaping is applied to the four 35-Mbits/sec binary bit streams via digital filters of the BTF [binary transversal filter] type.

The choice of number of BTF filter stages is the result of a tradeoff between accuracy of the emitted spectrum and the requirements of compact circuitry with low power consumption. With this technique, the control of intersymbol distortion is directly tied to the tolerance (2 percent) of the resistors used as BTF register loads and, a fact of considerable importance, no calibration is required.

A further advantage of using digital filters lies in the possibility of pre-equalizing the residual group delay of the overall channel, pre-distorting the in-phase response of the digital filtering by applying appropriate corrections to the BTF register loads. In particular, the in-phase response of the IF filter placed at the output of the modulator is equalized.

This filter is necessary for elimination of the spectral harmonics stemming from the sampling in the digital filters, and of other spurious components originating in the modulation process. The filter has a rather soft amplitude response and therefore does not require group delay equalization.

The 140-MHz carrier is generated by means of a VCO [voltage-controlled oscillator] locked in phase to a crystal-controlled reference-frequency oscillator, to achieve optimum frequency stability and low phase jitter.

The modulator module is shown in Fig 15 [not reproduced here].

Demodulator Module

Fig 16 shows the simplified block diagram of the 16 QAM demodulator. The demodulator restores, on two axes in quadrature, with linear operations, the two 4-level (PAM) signals, from which the four 35-Mbits/sec binary bit streams are recovered, after appropriate filtering and regeneration in the BB [baseband] processing circuit. Differential decoding removes the phase ambiguity of the restored carrier, and the subsequent parallel/series converter recombines the data into a single 140-Mbits/sec bit stream.

Extraction of the carrier, which is necessary for coherent demodulation, is accomplished by means of a modified Costas loop, with completely digital processing also taking place in the BB processing circuit.

The loop is shaped so that the residual phase jitter of the extracted carrier is less than 1° rms. The baseband circuits also provide gain control for the IF input stage. This guarantees constant signal level amplitudes at the decisional instant, even in the case of a significantly distorted channel.

Extraction of clock at the symbol frequency ($f_b/4$) is accomplished by means of envelope detection of the received IF signal, and selective filtering of

the $f_b/4$ track thus obtained, by means of a very-narrow-band quartz filter. In this way, the phase jitter of the extracted clock is less than 0.5° rms.

The demodulator also includes an adaptive baseband equalizer, whose operating principle is based on the correction, in the time domain, of the intersymbolic interference generated by multipath propagation.

The advantage of this class of equalizers lies in their ability to compensate for amplitude and phase distortions simultaneously.

The structure adopted in the 16 QAM demodulator consists of one LFE [linear feedback equalizer] stage associated with one DFE [decision feedback equalizer] stage, so as to optimize performance both in the case of a minimum-phase channel and in that of a nonminimum-phase channel.

The adaptivity algorithm is based on the "zero-forcing" principle, which requires relatively simple implementation and ensures always convergence.

The equalizer operates on the two axes in quadrature, correcting the intersymbolic interference both of one axis with itself and of one axis with the one in quadrature. This includes, therefore, analog delay lines (LFE) and digital delay lines (DFE), correlating circuits between baseband-processed signals, and linear multipliers for the control--hence the cancellation--of the various intersymbolic contributions.

The "signature" characteristic (see Appendix 2), measured at the 16 QAM demodulator associated with the IF equalizer, is shown in Fig 17. It shows that the configuration adopted is optimal if the probability of minimum-phase ($\tau > 0$) exceeds, as is assumed, 70-80 percent of the cases.

The BER characteristic of the complete modem, measured in the IF loop, is shown in Fig 18.

Adaptive IF Slope-and-Parabola Equalizer

The dynamic IF equalizer compensates the received-signal amplitude distortions caused by propagation phenomena (selective fading owing to multipath). As is well known, such phenomena are highly detrimental in the case of high-speed digital transmissions via microwave carrier. Amplitude distortions over the received-signal spectrum, even though of small magnitude, produce intolerable intersymbolic interference in the case of complex modulations of the 16 QAM type.

The function of the equalizer is to compensate distortions of the amplitude/frequency characteristic whose curves are of a cycloidal type (model of dual-path fading), allocated in any manner with respect to the central 140-MHz frequency. In particular, the equalizer is designed to compensate for amplitude distortions in the three typical cases indicated in Fig 19, where:

- a and b correspond to cases of positive and negative linear slope, respectively; and

- c corresponds to the case of selective (notch) attenuation.

Fig 20 shows the simplified block diagram of the equalizer.

The two equalizer stages B and C compensate for the distortions in the above-cited cases. Such compensation takes place adaptively by way of selective detection of level at three sample frequencies in the received spectrum, and subsequent positive feedback control of the appropriate equalizer sections.

A further control signal is furnished to an AGC circuit which acts on the input amplifier to maintain output-level stability.

Combiner

As mentioned above, one of the major problems encountered in digital radio links is selective fading owing to multipath, which can reduce received RF power and distort amplitude/frequency and group delay/frequency responses (see Appendix 1).

In the more critical sections of the system from this standpoint, the technique of space-diversity reception is used as a countermeasure, necessitating a combiner to add the signals arriving from the two antennas.

In the HTN-6u, the IF combiner was preferred over the RF type, for the following reasons: The IF type presents no installation problems from the standpoint of equalization of the feeders from the two antennas; it is directly usable regardless of the RF band used; it is easier to design and build; and it is more replicatable.

On the other hand, the RF combiner would have the advantage of requiring only one receiver.

The IF combiner performs the following functions:

- Gain control of each of the two diversity signals;
- Re-phasing of the two signals;
- Addition of the re-phased signals.

To this effect, the following have been inserted: An amplifier for each signal, with variable attenuator; a continuous phase-shifter on the secondary signal alone; and an adder.

As shown in the block diagram of the space-diversity receiver (Fig 7), there are three amplifiers with AGC, whose AGC signals are added and sent to a microprocessor-type logic element. This logic processes the received AGC information and generates direct commands to the phase shifter, causing the latter to shift the phase of the secondary IF signal by an amount that will result in the maximum output power after combining. The technique involved is known in the literature as "maximum-power" combining. The speed of the 360-degree continuous phase-shifter exceeds 10^4 degrees/sec.

The microprocessor module's software includes a self-test subroutine which, in the event of a malfunction of the control circuit, shuts out the secondary receiver circuit, permitting the system to continue operating on a single-receiver basis. When this occurs, an alarm signal is generated.

The variable attenuators inserted before the adder (see Fig 7) are controlled by software that receives AGC signals from the IF preamplifiers mounted inside the two (principal and secondary) modules. If the difference between the two received RF fields is $\leq$ 10 dB, the IF signal corresponding to the weaker received field is attenuated to the extent necessary to reset the difference (in dB) present at the RF stage. If the difference is > 10 db, the signal containing the lower power is attenuated to a greater extent.

This software achieves the aim of attributing greater weight, in the sum, to the incoming signal at the input of the receiver whose power is the greater of the two.

Fig 21 represents a simplified flow diagram summarizing the operating philosophy of the microprocessor-type software.

Design Technologies and Reliability Enhancement Techniques

In the design and construction of the new sophisticated digital equipment we have described, a considerable number of advanced criteria were used, so as to achieve all the desired electrical characteristics and reliability objectives of the hardware on a mass-production scale.

These criteria can be summarized as follows:

- Mechanical Technologies: Pressure die-casting and surface treatments designed to obtain replicatable electromagnetic compatibility characteristics, proof also against deterioration with aging of the equipment in difficult climatic environments.

- Circuit Technologies: Use of microstrip technology on a duroid or alumina substrate, for microwave-class components; thin film and thick film with extensive repetition of basically configured circuits, in the IF and BB sections.

- Application of modern technical criteria relating to equipment reliability enhancement: Laboratory sifting and endurance tests with application of technical and mechanical stresses at the module and system levels. This method enables quality control of the equipment, from the preproduction to the large-scale mass production stages, with successive optimizations that continue throughout the life of the product.

Test Link

Since February 1981, a test link has been in operation between the Telettra plant in Vimercate and the Mozzecane site (Piacenza) using the HTN-6u transceiver and the CMF 40 modem. The radio segment is unidirectional, and the

receiving station is installed in the tower located in front of the office building. Recording and data acquisition systems have also been installed in the tower's equipment section.(7)

Link Configuration

The Mozzecane-Vimercate test link, spanning approximately 60 km (Fig 22), traverses the Po Valley, which is a climatically difficult area from the standpoint of propagation. This facilitates the acquisition of useful data for the study that is to be carried out.

At Vimercate, the installation consists of two 2-meter-diameter antennas positioned near the top of the radio tower, and separated from each other by a vertical distance of 17 meters for effective space diversity. Each antenna is of the dually polarized type. The upper antenna covers the frequencies in the 7-GHz band, while the lower one covers two frequency bands, namely, the 7-GHZ and the 11-GHz bands.

An identical arrangement has been used at Mozzecane, except that the vertical spacing is the minimum necessary.

As for the radio equipment, the Mozzecane installation consists only of transmitters, specifically, two 7-GHz transmitters and one 11-GHz transmitter (Fig 23). On the 11-GHz channel, transmission is bidirectional, to facilitate service communication between the two sites.

During the period in which error measurements are being made, the 7-MHz and 11-MHz channels are modulated, respectively, with 140-Mbits/sec 16 QAM and 34-Mbits/sec 4 PSK signals. At Vimercate, the results of the measurements are gathered and recorded by an automated data acquisition system (Fig 24).

To avoid the complete loss of recorded data that would result from a power outage, no matter how short, the radio equipment and data acquisition system equipment are fed by a no-break power system.

Quality of Unprotected 140-Mbits/sec Channel

Quality and availability measurements relative to the unprotected 140-Mbits/sec - 7-GHz channel are shown in Table 1 for various measurement periods.

The quality is characterized by the sum of the periods with BER > 10^{-3} and of a duration of less than 10 consecutive seconds; nonavailability is characterized by the sum of periods with BER > 10^{-3} and of a duration equal to or greater than 10 seconds.

The month of January 1983 was found to be the worst of the entire cycle of measurements, with a quality having a probability of 4.6×10^{-4} for BER 10^{-3}, and 6.1×10^{-3} for BER 10^{-7}.

For the same month, nonavailability was found to have a probability of 3.1×10^{-4} (Fig 25).

A comparison of these values with the quality objectives set by the CCIR indicates that, during the worst month, the quality of the unprotected channel relative to BER 10^{-3} is 38 times worse than CCIR limits, while the quality relative to BER 10^{-7} is 25 times worse.

As regards the EFS [error-free-seconds] objective, it is found to exceed CCIR limits whenever the quality falls outside those limits.

It can be concluded that, over a 60-km link, with $P_o = 0.35$, during the worst month, a 140-Mbits/sec 16 QAM system requires some protection against atmospheric multipath fading, in order to meet the quality and nonavailability objectives set by the CCIR.

The histogram of Fig 26 represents the observed number of times BER $\geq 10^{-3}$, as a function of the duration of those events; the most probable duration was found to be 1 second.

Space Diversity With Combiner

Two types of combiners were tested: An RF combiner and an IF combiner, both based on the "maximum-power" principle. For the reasons cited above, the IF combiner was preferred as the final solution.

Fig 27 diagrams the measurement setup used for space diversity reception with combiner.

The results of measurements relative to the month of November, expressed in terms of BER $\geq 10^{-3}$ and sync loss, are shown in Table 2. The improvement introduced by space diversity with combiner was 97.3 times.

IF Equalizer

Fig 28 shows the measurement setup used for the IF slope-and-parabola equalizer (10 dB). The field test of this equalizer yielded the same performance data as was obtained in the laboratory.

The improvement introduced, with respect to the unprotected channel, was 1.25 to 2 times, depending on propagation conditions.

This improvement may seem small, but the fact should be noted that it is relative to a modem whose "signature" characteristic was already inherently optimal.

This means that most of the equalization takes place in baseband. Even the "unprotected" channel always includes baseband equalization.

System Performance Characteristics

As a result of the particular care that went into the design and construction of the HTN-6u transceiver and CFM-40 modem circuits, and owing to the effectiveness of the countermeasures adopted (IF equalizer, BB equalizer, IF

combiner), the design target objectives for the development of this system were amply met. The results obtained are well within the limits set by the CCIR.

The significant performance values of the system are summarized in the "signature" and BER curves shown in Figs 29 and 30. These curves bear out the improvements introduced by the countermeasures cited above.

BER curves showing the behavior of the system in the presence of cochannel interference are also given (Fig 31).

Conclusions

This article has described the design and construction criteria, as well the performance test results, relative to the new HTN-6u 140-Mbits/sec, 7-GHZ digital microwave system.

Particularly detailed treatment has been accorded the new problems that have had to be addressed in the design of this system, versus traditional analog systems: High linearity of RF and IM amplification circuits, with use of predistortion, and selective-fading countermeasures.

The mechanical and circuit-design solutions were addressed from the standpoints of building a high degree of flexibility into the system and of facilitating its maintenance.

The components and construction technologies were selected with particular care and amply tested to ensure attainment of the necessary performance characteristics and reliability.

Acknowledgments

The authors wish to thank their colleagues of the Telettra and GTE Microwave System Laboratories for their contributions to the design and construction of the system described in this article; particular thanks are hereby expressed to B. Bacetti, F. Cagliari, F. Fabbri, G. Mantovani and R. Saviotti for the important part they played in the the designing of the equipment and for their highly valued suggestions.

[End of main body of text; numbered Figs and Tables cited above, and Bibliography, follow after Appendix 1 and Appendix 2]:

Appendix 1

Mathematical Model of Fading

Illustrated here is the mathematical model of a channel affected by fading, which has been used for the study and design of the countermeasures. The model is of the "simplified 3-ray" type.

Let us consider a channel characterized by three paths (Fig A 1.1) and let us designate the amplitudes of the signals relative to the three paths, at their arrival at the input of the receiver, 1, a_1 and a_2. The signals relative to the second and third paths are delayed with respect to the first by τ_1 and τ_2 respectively.

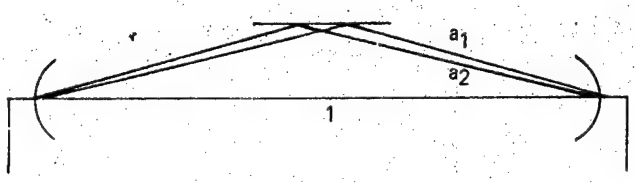


Fig A 1.1

The transfer function of the channel thus constructed is:

$$H(j\omega) = 1 + a_1 e^{-j\omega\tau_1} + a_2 e^{-j\omega\tau_2}$$

and the vector diagram relative to pulse ω is the one represented in Fig A 1.2:

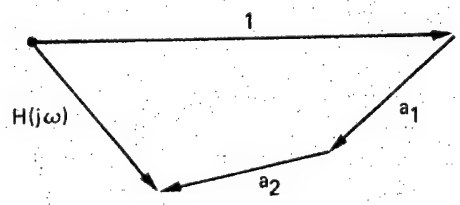


Fig A1.2.

In defining the simplified 3-ray model, τ_1 is assumed to be sufficiently small so that, if ω_2 and ω_1 are the extremes of the band of interest, then:

$$(\omega_2 - \omega_1)\,\tau_1 \ll 1 \text{ rad.}$$

In this case, the phase shift introduced by ray a_1 is constant throughout the band and, if its value is π, the vector diagram of Fig A 1.2 becomes that of Fig A 1.3:

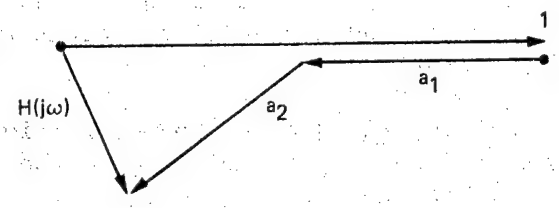


Fig A 1.3

Designating the sum vector of the first two rays as [letter] a, and putting $\tau_2 = \tau$ and $a_2 = ab$, we obtain the vector diagram of Fig A 1.4. In this way, the channel model is formally reduced to a 2-ray model, with a direct ray of amplitude a and an echo of amplitude ab:

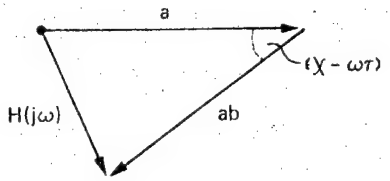


Fig A 1.4

The corresponding transfer function is:

$$H(j\omega) = a(1 - be^{-j\omega\tau}e^{-j\chi}) \qquad \text{(A 1.1)}$$

where: a is a coefficient less than 1, which represents a constant attenuation (in the band of interest);
b is the amplitude of the echo relative to that of the direct ray;
τ is the propagation delay with respect to the direct ray;
χ is the phase shift of the echo with respect to the direct signal.

Putting $\omega_o = -\frac{\chi}{\tau}$, (A 1.1) becomes:

$$H(j\omega) = a(1 - be^{\mp j(\omega-\omega_0)\tau})$$

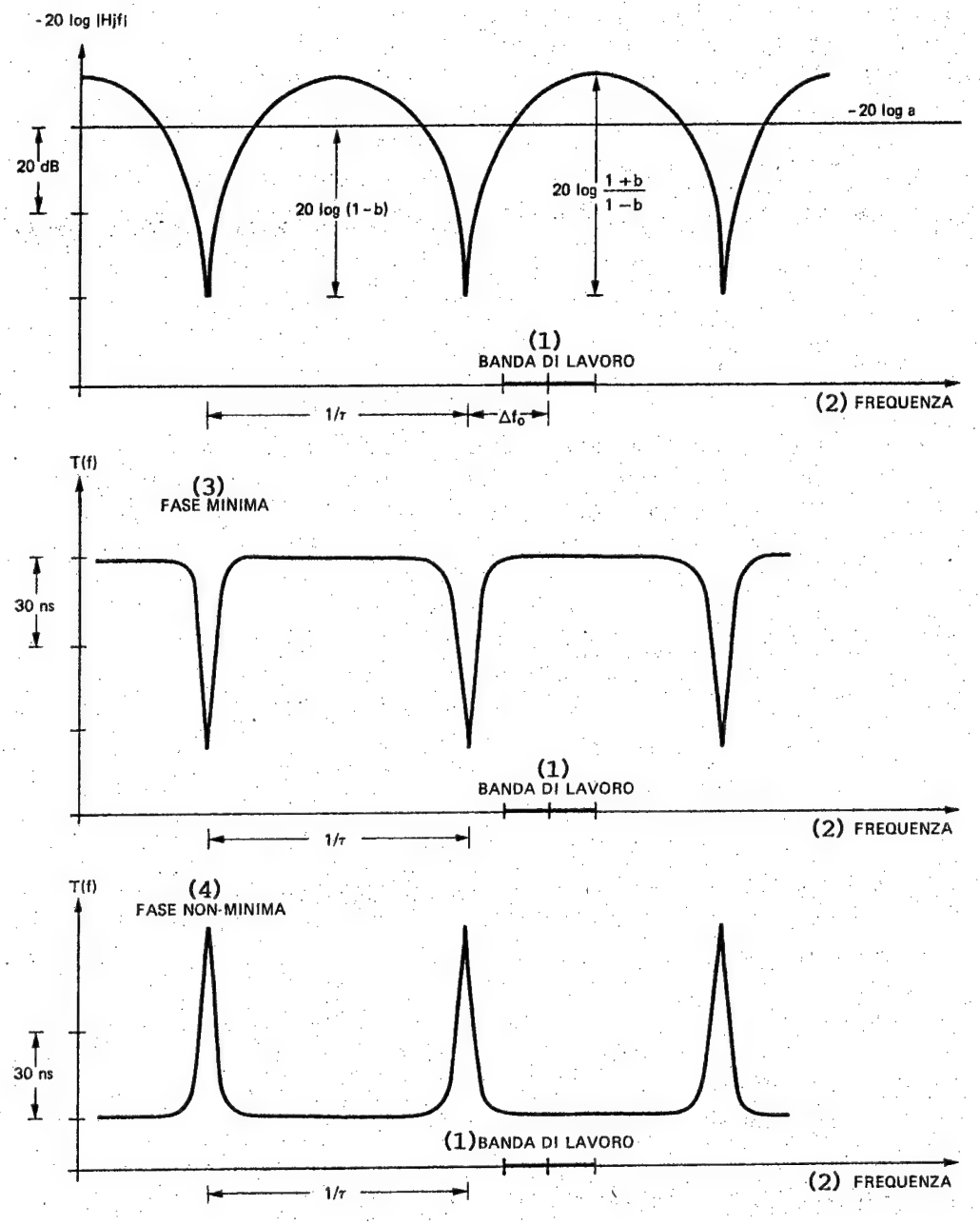


Fig A 1.5

Key:

1. Working band.
2. Frequency.
3. Minimum phase.
4. Nonminimum phase.

The - or + symbol shown in the exponent indicates that the channel is, respectively, in the minimum-phase state or the nonminimum-phase state (in other words, that the zeroes of the transfer function have a negative real or a positive real part). The ambiguity of the sign does not alter $|H(j\omega)|$, whereas it does act on the group delay $T(\omega)$.

$|H(j\omega)|$ and $T(\omega)$ are expressed by:

$$|H(j\omega)| = a\sqrt{1+b^2-2b\cos(\omega-\omega_o)\tau}$$

$$T(\omega) = \mp\frac{b^2\{\cos[(\omega-\omega_o)\tau]-b\}}{1+b^2-2b\cos[(\omega-\omega_o)\tau]}$$

The curves of $|H(j\omega)|$ and $T(\omega)$ are shown in Fig A 1.5. From these curves it is found that selective fading introduces minimums (known as "notches") in the amplitude/frequency response, the positions of which vary when the phase shift $\omega_o\tau$ (constant versus frequency) is varied, and whose reciprocal distance is $1/\tau$.

Fig A 1.5 also shows that $\Delta f_o = \omega_o/2\pi$ indicates the distance (in Hz) of the notch from the center of the working band.

Appendix 2

'Signature'

The "signature" is a characteristic of recent introduction into the performance requirements a microwave system must meet.

It consists of a curve which, with reference to Appendix 1, is generated by plotting the displacements of the notch with respect to band center (Δf_o) as abscissae, and the depth of the notch itself, $B_c = -20 \log(1 - b)$, as ordinates.

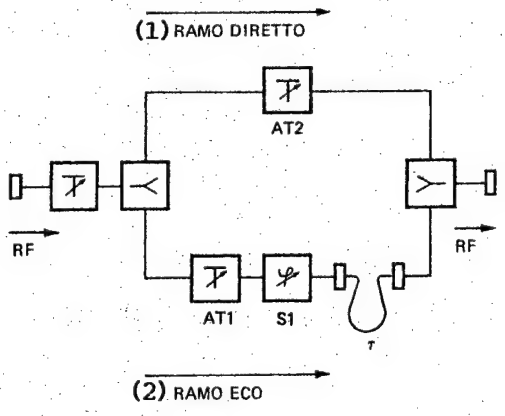
Families of signature curves can be drawn for various values of echo delay and for various values of BER.

The area subtended by the signature curves drawn for BER = 10^{-3} represents a fundamental given for calculating the nonavailability of a microwave link owing to selective fading.

The signature can be measured in a simple manner by using a fictitious microwave section offering the possibility of simulating the presence of an echo.

The phase and amplitude of the echo must be controlled, whereas the delay is fixed by inserting a waveguide section of appropriate length.

The block diagram of the measurement setup is shown in Fig A 2.1:



Key:
1. Direct branch.
2. Echo branch.

Fig A 2.1

The position of the notch within the RF signal band can be monitored by means of a spectrum analyzer, and its displacement from band center adjusted by means of phase shifter S-1; the depth of the notch can be adjusted by means of attenuator AT1.

To facilitate reading, the displacement of the notch can be expressed on the phase shifter in Hz/degree, as follows:

$$\text{Hz/degree} = \frac{1/\tau}{300}$$

[End of Appendix 2; diagrams and tables follow]:

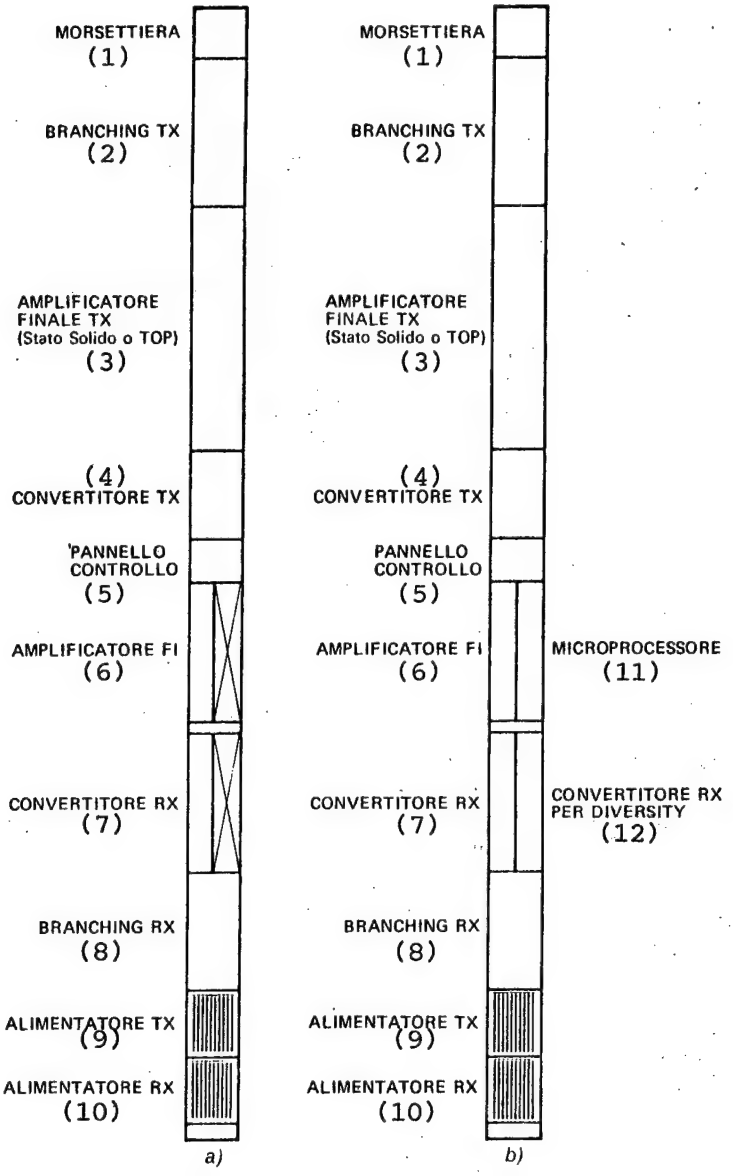


Fig 1 - Configuration of HTN-6u radio rack for: a) Single-receiver reception; b) Space-diversity reception.

Key:

1. Terminal board.
2. Transmit branching.
3. Final transmit amplifier (solid state or TWT).
4. Transmit converter.
5. Control panel.
6. IF amplifier.
7. Receive converter.
8. Receive branching.
9. Transmit power supply.
10. Receive power supply.
11. Microprocessor.
12. Receive converter for diversity.

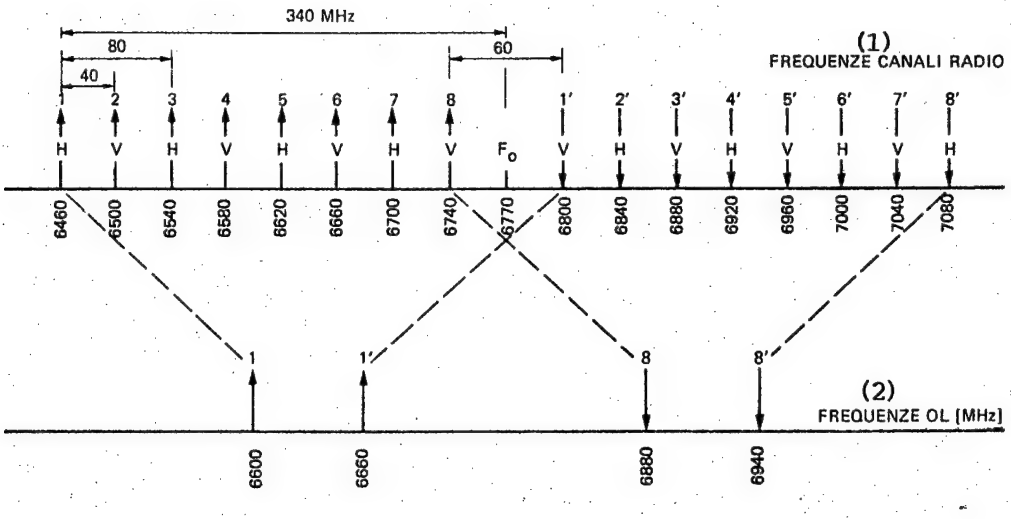


Fig 4 - RF channeling and positioning of local oscillators.

Key:

1. Radio channel frequencies.
2. Local oscillator [LO] frequencies.

Legend:

H = Horizontal polarization.
V = Vertical polarization.

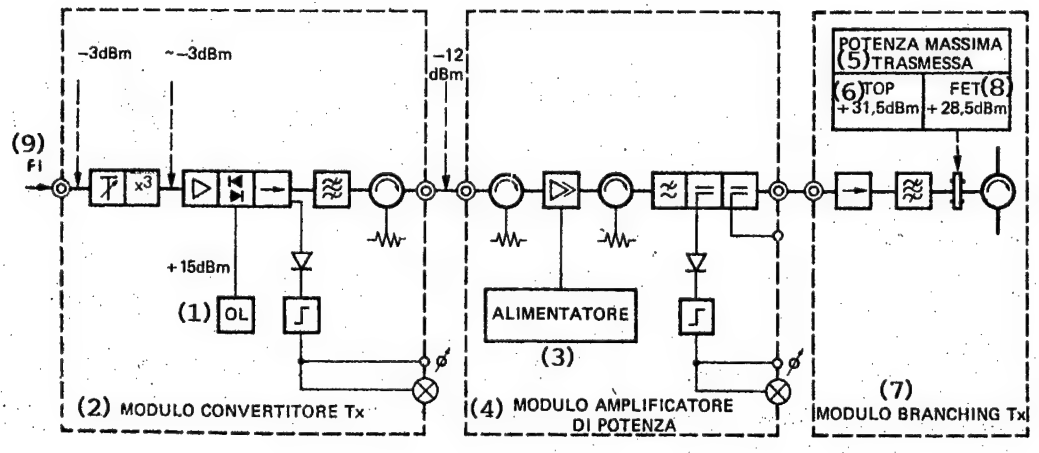


Fig 5 - Simplified block diagram of transmitter.

Key:

1. Local oscillator.
2. Transmit converter module.
3. Power supply.
4. Power amplifier module.
5. Maximum transmitted power.
6. Traveling-wave tube.
7. Transmit branching module.
8. Field-effect transistor.
9. Intermediate frequency.

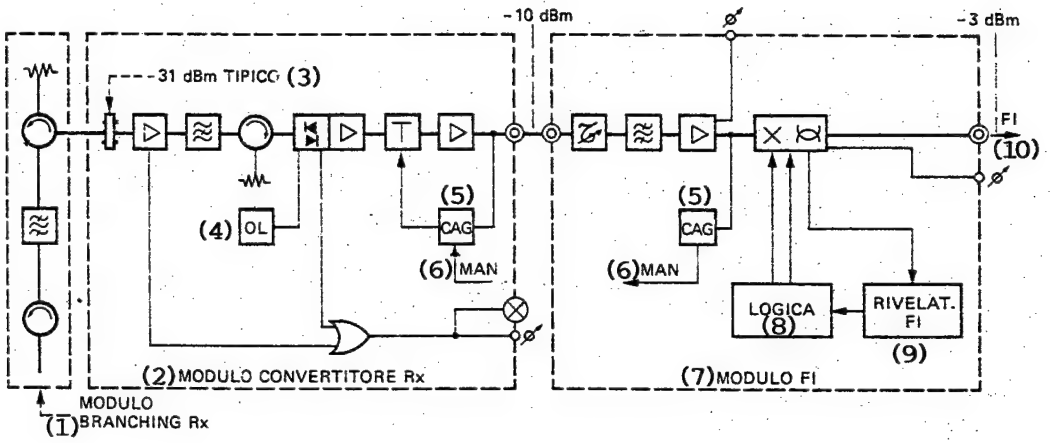


Fig 6 - Simplified block diagram of receiver in single-receiver configuration.

Key:

1. Receive branching module.
2. Receive converter module.
3. Typical [value].
4. Local oscillator.
5. Automatic gain control.
6. Manual.
7. IF module.
8. Software..
9. IF detector.
10. IF output.

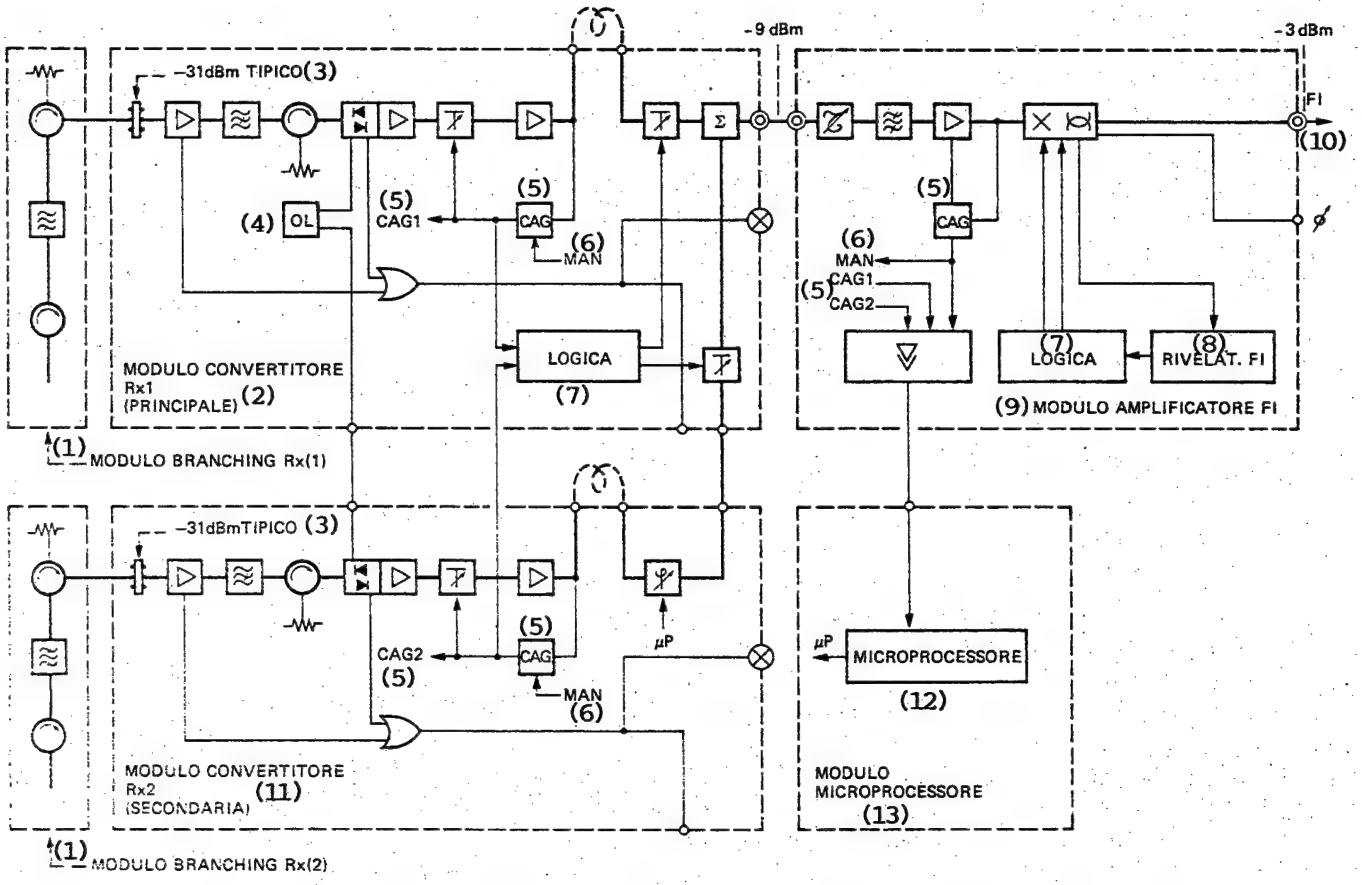


Fig 7 - Simplified block diagram of receiver in space diversity configuration.

Key:

1. Receiver 1 branching module.
2. Receiver 1 converter module (primary).
3. Typical [value].
4. Local oscillator.
5. Automatic gain control [number].
6. Manual.
7. Software.
8. IF detector.
9. IF amplifier module.
10. IF output.
11. Receiver 2 converter module (secondary).
12. Microprocessor.
13. Microprocessor module.

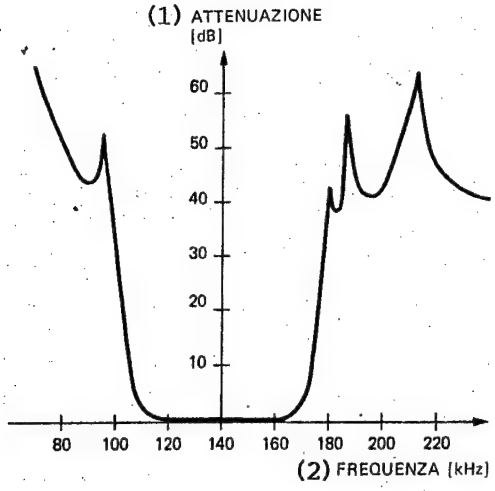


Fig 11 - Out-of-band attenuation characteristic of IF filter.

Key:

1. Attenuation.
2. Frequency (kHz).

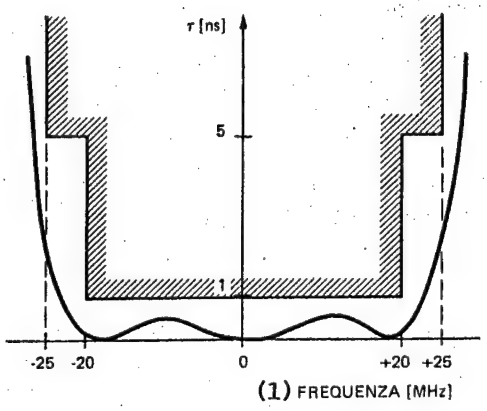


Fig 12 - Group delay characteristic of IF filter.

Key:

1. Frequency (MHz).

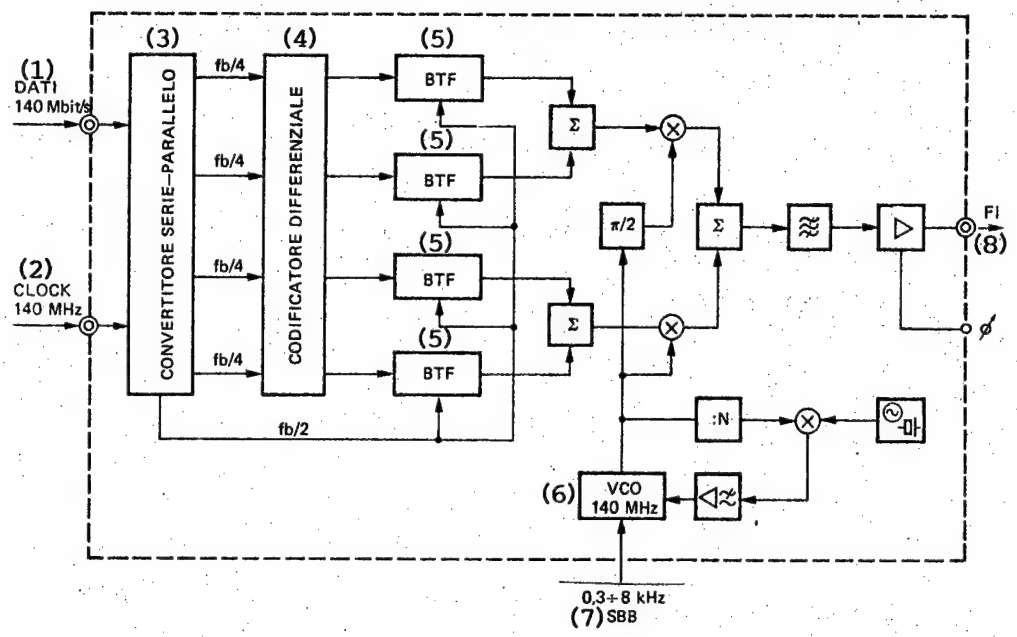


Fig 14 - Simplified block diagram of modulator.

Key:

1. 140-Mbits/sec data.
2. 140-MHz clock.
3. Series-parallel converter.
4. Differential encoder.
5. Binary transversal filter.
6. 140-MHz voltage-controlled oscillator.
7. 0.3-8 kHz subbaseband.
8. IF output.

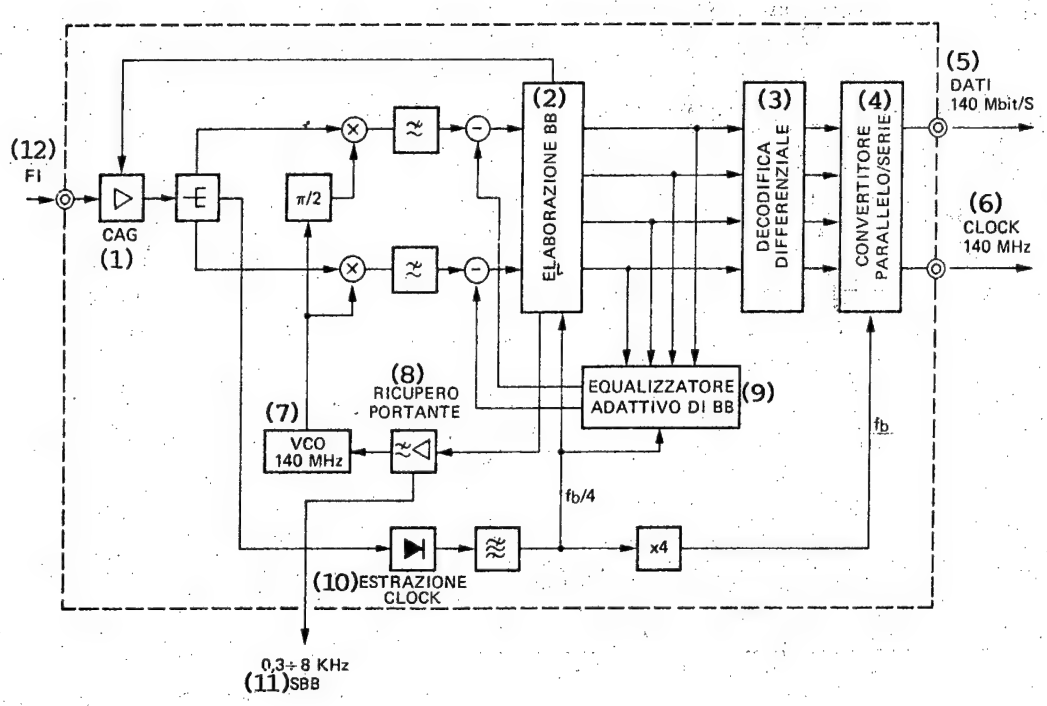


Fig 16 - Simplified block diagram of demodulator.

Key:

1. Automatic gain control.
2. Baseband processing.
3. Differential decoding.
4. Parallel/series converter.
5. 140-Mbits/sec data.
6. 140-MHz clock.
7. 140-MHz VCO.
8. Carrier reinsertion.
9. Adaptive baseband-equalizer.
10. Clock extraction.
11. 0.3-8 kHz subbaseband.
12. Intermediate frequency.

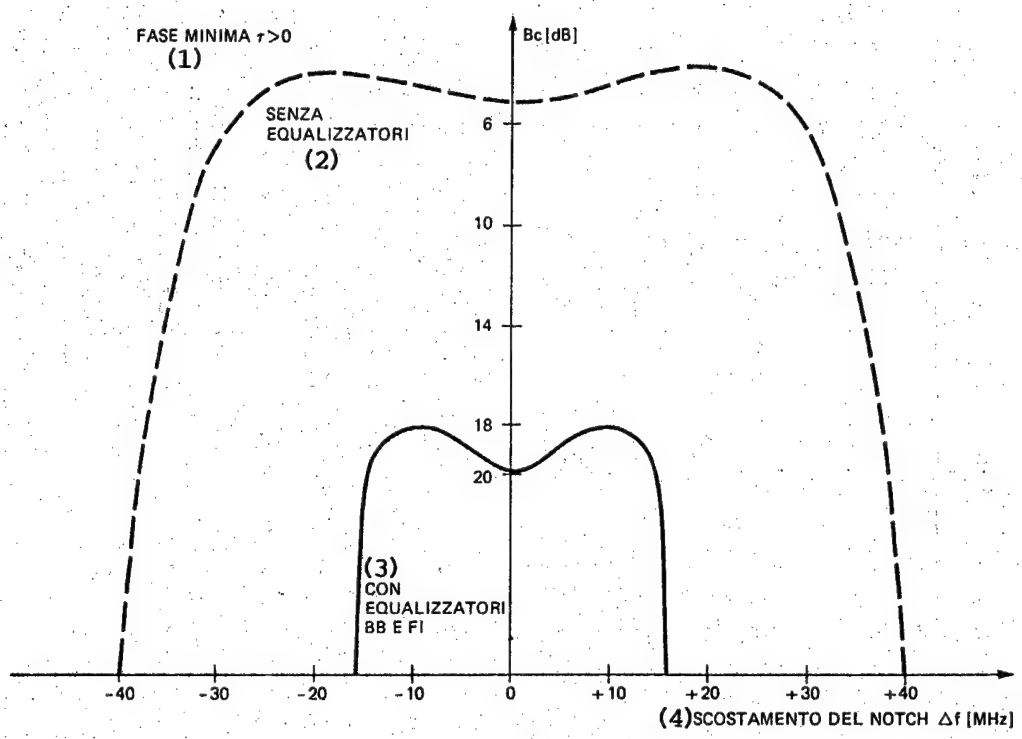


Fig 17 - Signature characteristic of modem measured with an echo delay of 4 nanoseconds.

Key:

1. Minimum phase.
2. Without equalizers.
3. With baseband and IF equalizers.
4. Displacement of notch.

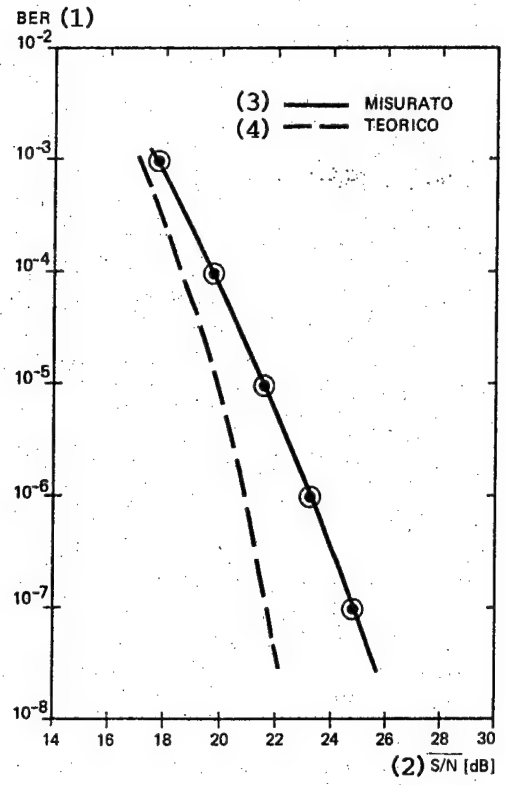


Fig 18 - Bit error rate in IF loop as a function of signal/noise ratio.

Key:

1. Bit error rate.
2. Signal/noise ratio (dB).
3. Measured.
4. Theoretical.

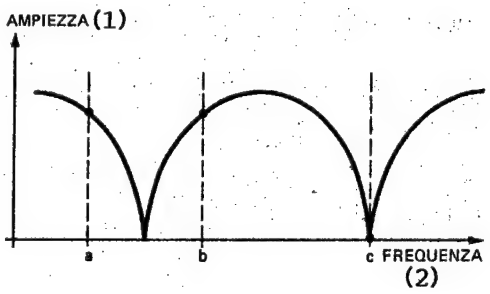


Fig 19 - Amplitude/frequency response in 2-ray model of fading.

Key:

1. Amplitude.
2. Frequency.

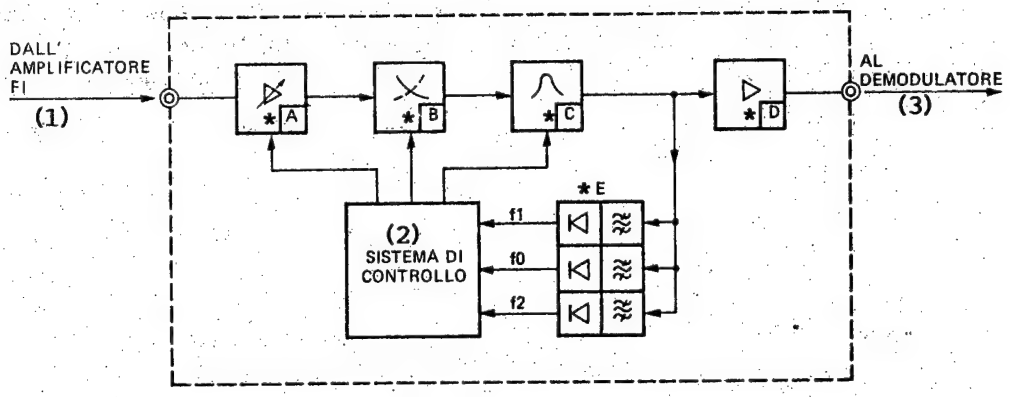


Fig 20 - Block diagram of dynamic equalizer unit.

*Legend:

A = Automatic level control.
B = Slope equalizer.
C = Notch equalizer.
D = IF amplifier.
E = Spectrum detector.

Key:

1. From IF amplifier.
2. Control system.
3. To demodulator.

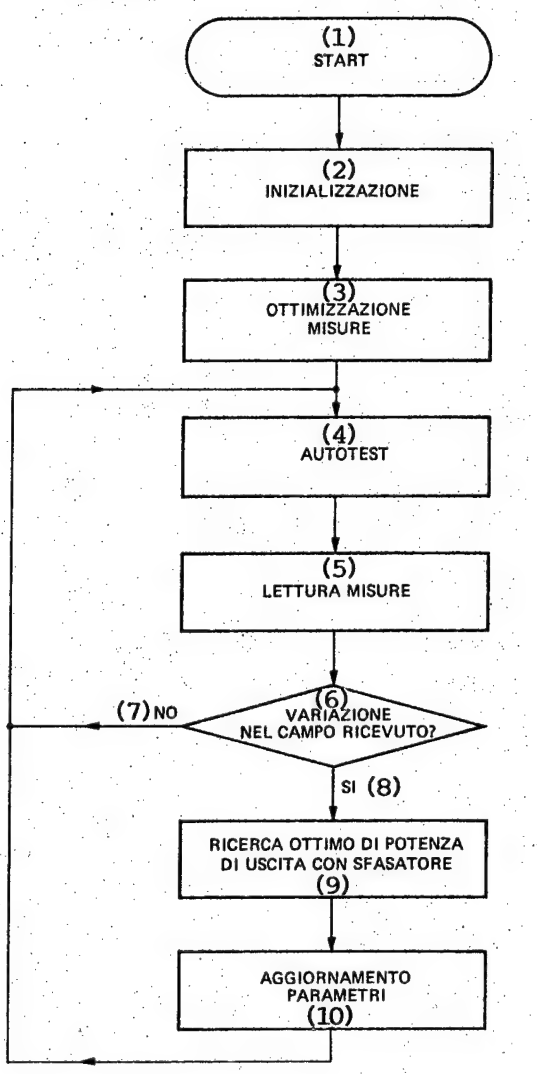


Fig 21 - Flow diagram of microprocessor control-software.

Key:

1. Start.
2. Initialization.
3. Optimization of measurements.
4. Self-testing.
5. Reading of measurements.
6. Change in received field?
7. No.
8. Yes.
9. Output power optimization search with phase shifter.
10. Updating of parameters.

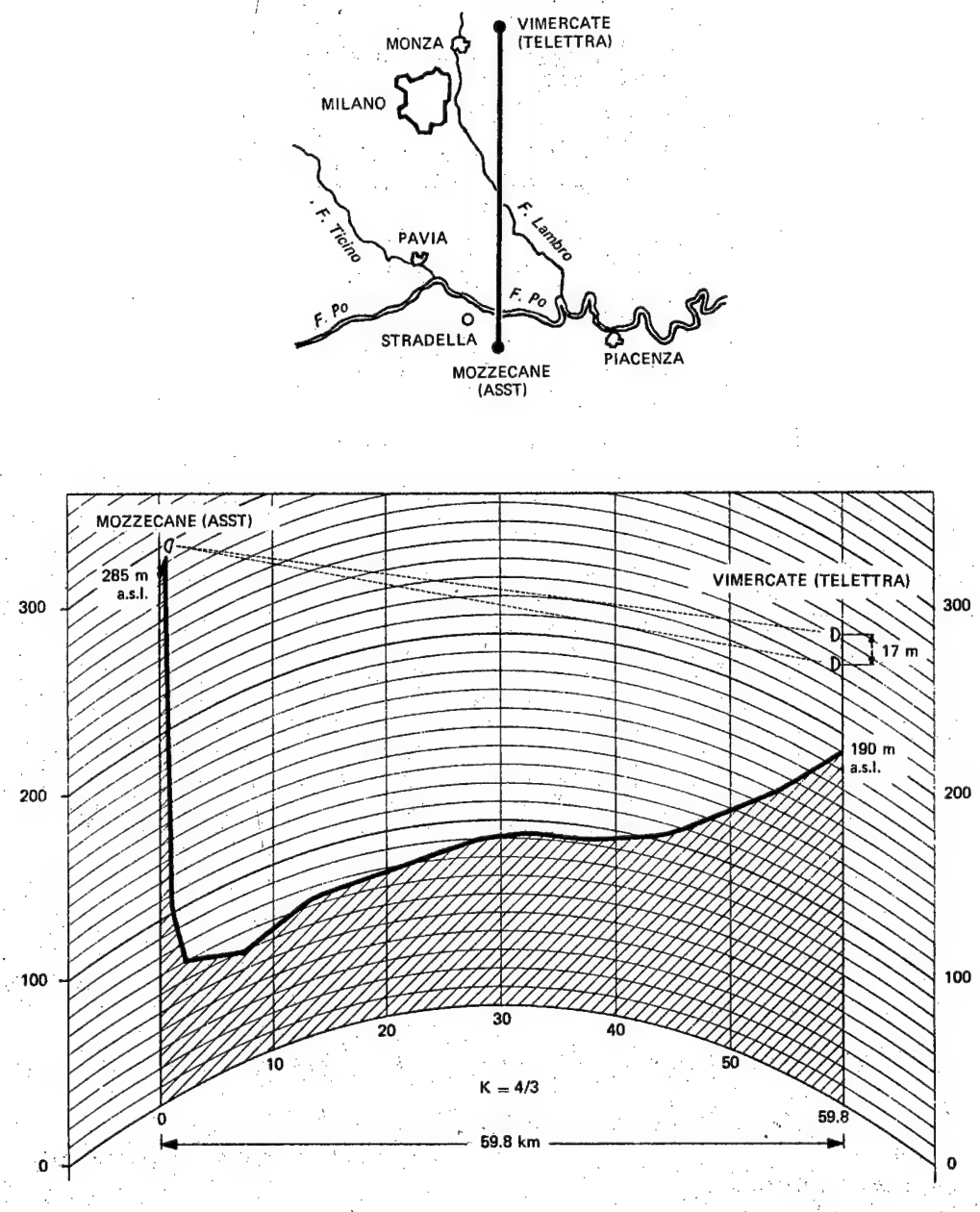
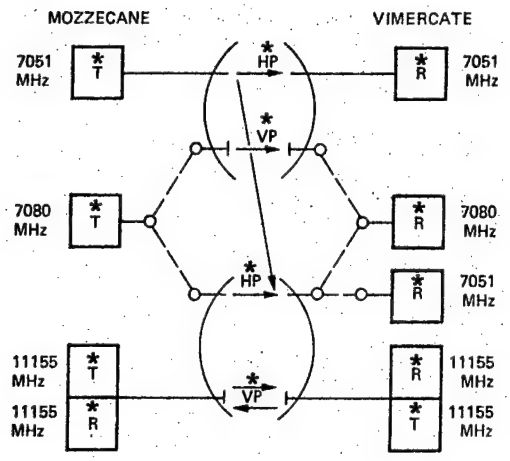


Fig 22 - Mozzecane-Vimercate microwave link: (above) Geographical map; (below) Altitudinal profile.



*Legend:
T = Transmitter.
R = Receiver.
HP = Horizontal polarization.
VP = Vertical polarization.

Fig 23 - Overall configuration of the link.

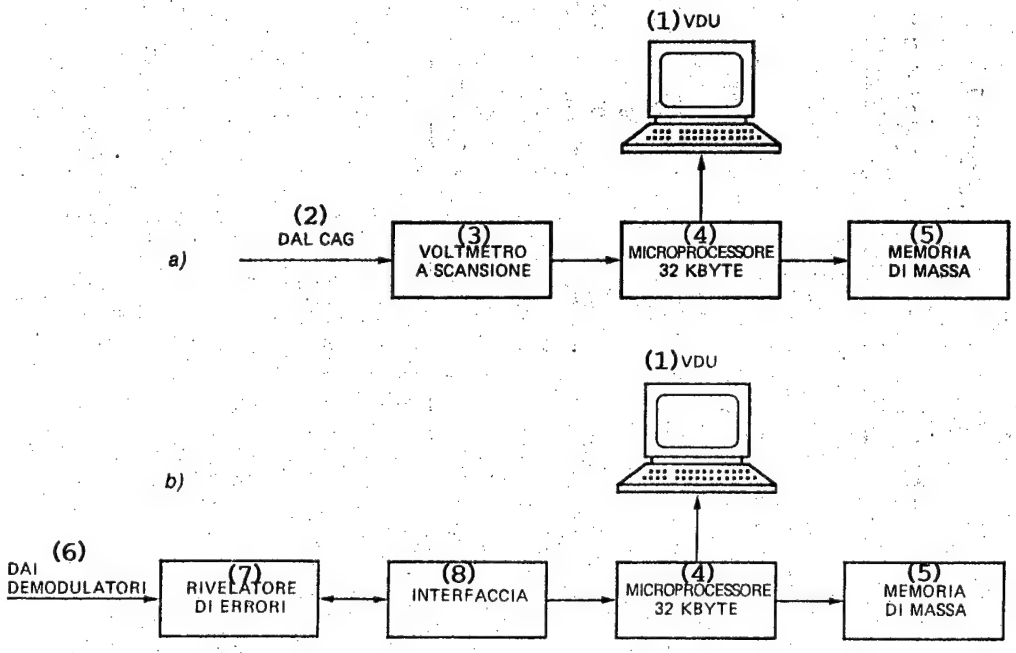


Fig 24 - Data acquisition system: a) Relative to received field; b) Relative to bit error rate.

Key:

1. Visual display unit.
2. From AGC.
3. Scanning voltmeter.
4. 32-Kbyte microprocessor.
5. Mass memory.
6. From demodulators.
7. Error detectors.
8. Interface.

Table 1

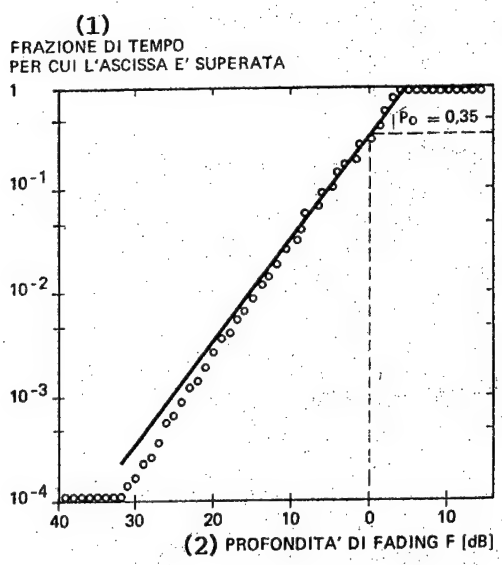
Values, Measured During Different Periods, of Quality and Nonavailability of 140-Mbits/sec, 7-GHz Unprotected Microwave Channel with 16 QAM Modulation

(1) Periodo di prova		(2) Durata complessiva della prova	(3) BER^{-3}				(3) BER^{-7}		(6) Secondi senza errori		(7) Secondi con errori
			(4) Qualità		(5) Indisponibilità						
(8) mese		(9) (s)	(s) (9)	(prob.) (10)	(s) (9)	(prob.) (10)	(s) (9)	(prob.) (10)	(s) (9)	(prob.) (10)	(prob.) (10)
(11) Novembre	1982	2592000	146	$5,6 \times 10^{-5}$	0	0	*	*	*	*	*
(12) Dicembre	1982	1725000	642	$3,7 \times 10^{-4}$	0	0	4038	$2,3 \times 10^{-3}$	*	*	*
(13) Gennaio	1982	1298880	603	$4,6 \times 10^{-4}$	397	$3,1 \times 10^{-4}$	7877	$6,1 \times 10^{-3}$	*	*	*
(14) Marzo	1983	1882800	87	$4,6 \times 10^{-5}$	0	0	416	$2,2 \times 10^{-4}$	1882358	0,999765	$2,3 \times 10^{-4}$
(15) Aprile	1983	2131200	10	$4,7 \times 10^{-6}$	0	0	20	$9,4 \times 10^{-6}$	2131179	0,999990	$1,0 \times 10^{-5}$
(16) Maggio	1983	2502000	1	$4,0 \times 10^{-7}$	0	0	8	$3,2 \times 10^{-6}$	2501992	0,999997	$3,2 \times 10^{-6}$
(17) Giugno	1983	1800000	70	$3,9 \times 10^{-5}$	118	$6,6 \times 10^{-5}$	568	$3,1 \times 10^{-4}$	1799430	0,999683	$3,2 \times 10^{-4}$

* Non misurati. (18)

Key:

1. Test period.
2. Overall duration of test.
3. Bit error rate.
4. Quality.
5. Nonavailability.
6. Errorless seconds.
7. Seconds with errors.
8. Month.
9. Seconds.
10. Probability.
11. November.
12. December.
13. January.
14. March.
15. April.
16. May.
17. June.
18. Not measured.



Key:

1. Fraction of time for which abscissa is exceeded.
2. Depth of fading F (dB).

Fig 25 - Distribution of fading at 7 GHz during worst month (January 1983).

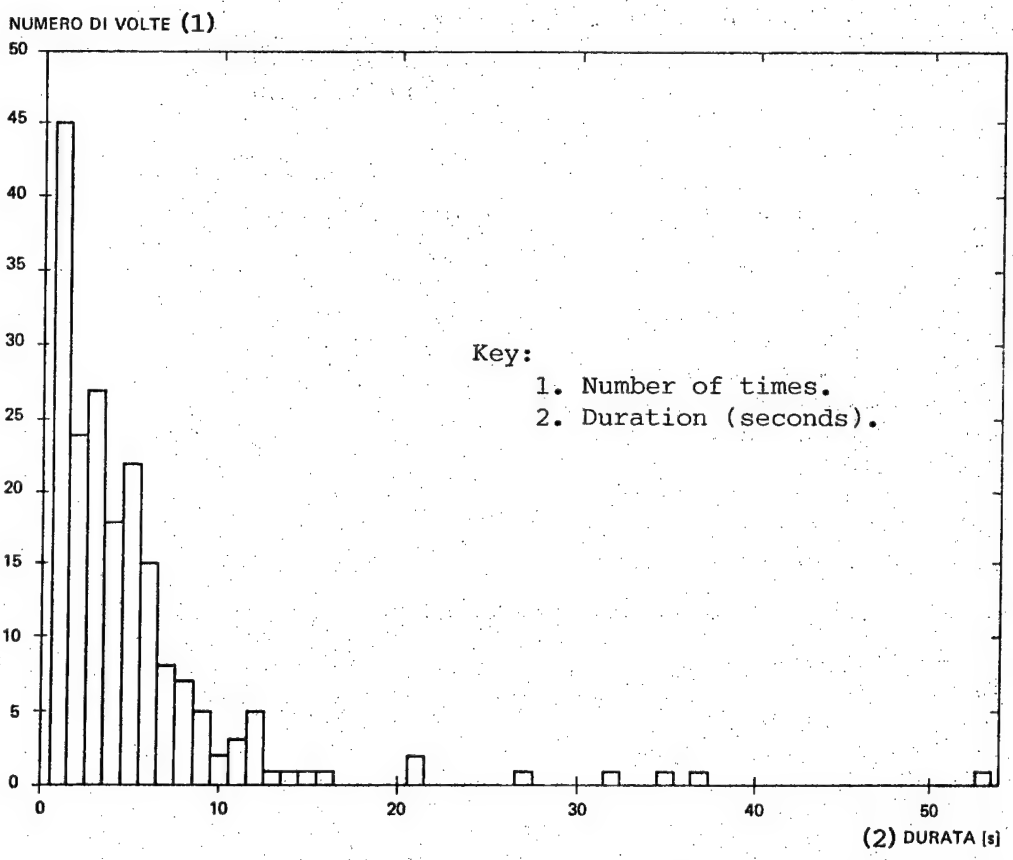


Fig 26 - Histogram of number of events with BER 10^{-3} as a function of duration of the events (140 Mbits/sec, 16 QAM. January 1983).

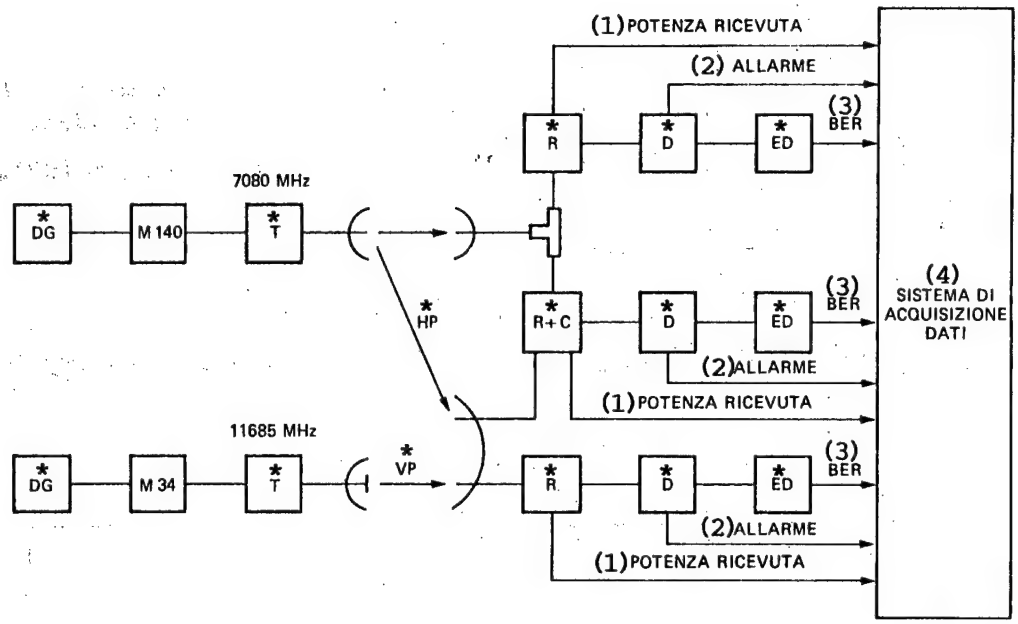


Fig 27 - Measurement setup for space diversity test with combiner.

*Legend:

DG = Data generator.
M = Modulator.
T = Transmitter.
R = Receiver.
R+C = Receiver with combiner.
D = Demodulator.
ED = Error detector.
HP = Horizontal polarization.
VP = Vertical polarization.

Key:

1. Received power.
2. Alarm.
3. Bit error rate.
4. Data acquisition system.

Table 2

Performance of 140-Mbits/sec, 7-GHz Unprotected Channel Received on Space Diversity with Combiner, and of 34-Mbits/sec, 11 GFz Unprotected Channel

(1) Sistema		(2) Durata complessiva della prova	(3) Sync loss		(4) BER 10^{-3}	
		(s) (5)	(s) (5)	(prob.) (6)	(s) (5)	(prob.) (6)
140 Mbit/s - 7 GHz	non protetto (7)	2592000	69,0	$2,5 \times 10^{-5}$	146,0	$5,6 \times 10^{-5}$
140 Mbit/s - 7 GHz	in diversità di spazio con combinatore (8)		0	0	1,5	$5,8 \times 10^{-7}$
34 Mbit/s - 11 GHz	non protetto (7)		56,5	$2,2 \times 10^{-5}$	86,0	$3,3 \times 10^{-5}$

Key:

1. System.
2. Overall duration of test.
3. Sync loss.
4. Bit error rate.
5. Seconds.
6. Probability.
7. Unprotected.
8. On space diversity with combiner.

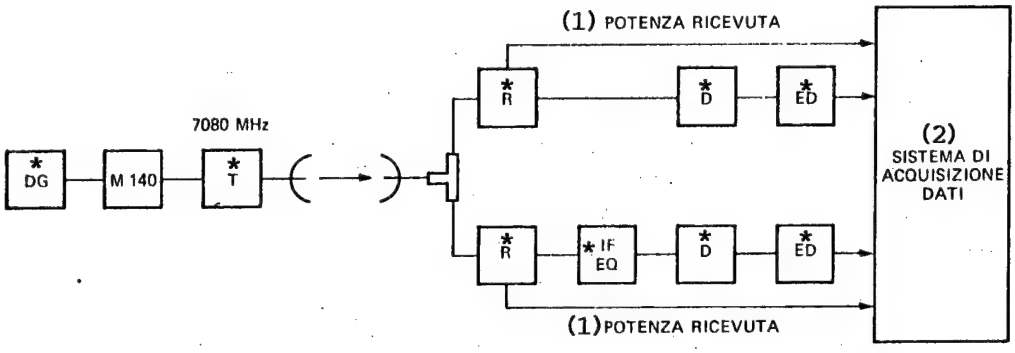


Fig 28 - Test measurement setup with IF equalizer.

*Legend:

DG = Data generator.
M = Modulator.
T = Transmitter.
R = Receiver.
IFEQ = IF equalizer.
D = Demodulator.
ED = Error detector.

Key:

1. Received power.
2. Data acquisition system.

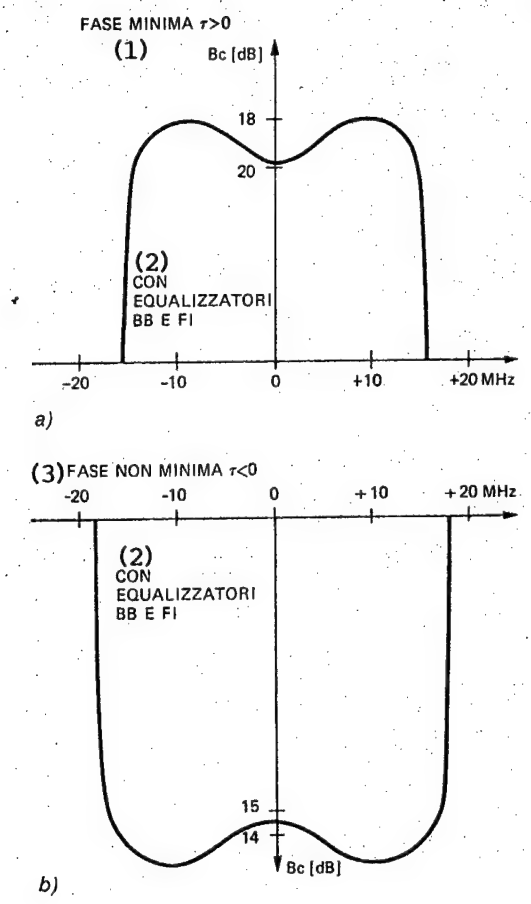


Fig 29 - HTN-6u system's signature characteristic: a) Minimum phase; b) Nonminimum phase.

Key:

1. Minimum phase.
2. With baseband and IF equalizers.
3. Nonminimum phase.

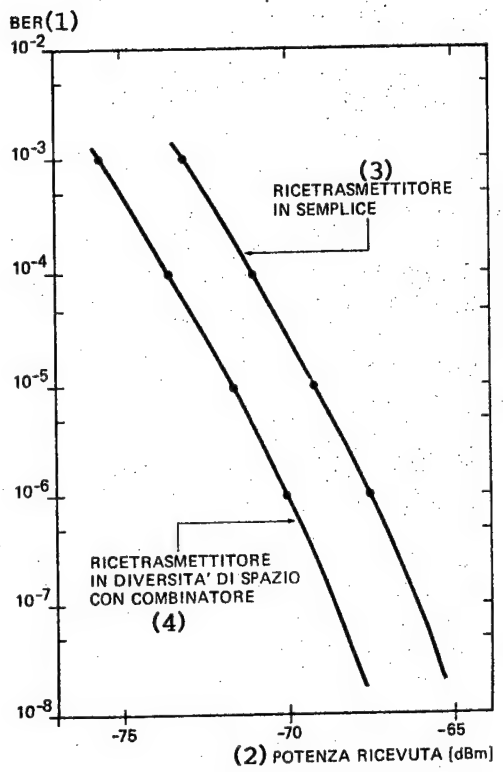


Fig 30 - BER curves of HTN-6u system.

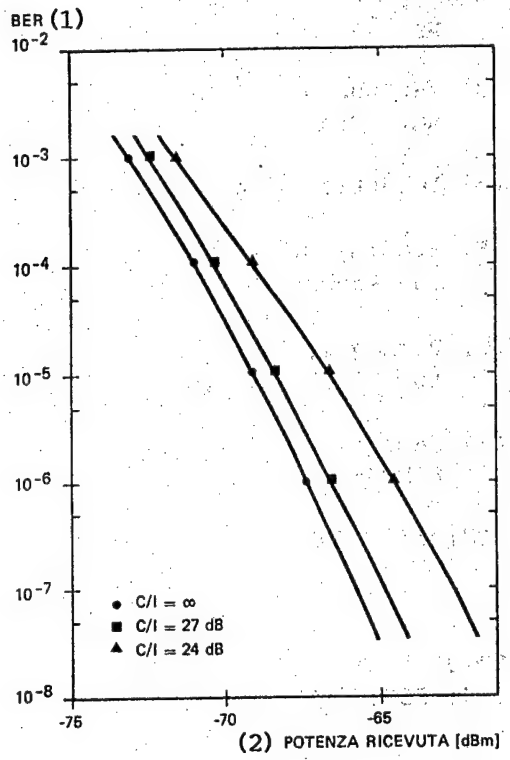


Fig 31 - BER curves of HTN-6u system, measured in presence of cochannel interference, for various values of C/I.

Key to Figs 30 and 31:

1. Bit error rate.
2. Received power (dBm).
3. Transceiver in single-receiver configuration.
4. Transceiver in space diversity configuration with combiner.

BIBLIOGRAPHY

(1) Various authors: "ICC Conference Record" - Vol 2, Boston, June 1983.

(2) Siemens A.G.: "Telecom Report" - Vol 6, No. 5, Geneva, October 1983, pp 215-249.

(3) Various authors: "ICC '84 Links for the Future" - Vol 2, Amsterdam, May 1984.

(4) Telettra Patent: "Application No. 216214/83, Filed 15 June 1983."

(5) Arosio, D.; Corbetta, G.; Marconcini, A.: "Cavity Stabilized Oscillators for Advanced Analog and Digital Radio Links"; IEEE MTT-S Digest, 1983.

(6) Barzaghi, A.; Oggioni, F.; Pratesi, G.: "GaAs FET Linear Power Amplifiers for 16 QAM Signals"; IEEE MTT-S Digest, 1983.

(7) Fabbri, F." "Field Tests on High Capacity Digital Radio Systems": ALTA FREQUENZA, Vol LIII, No. 1, January/February 1984.

[Editor's Note]: Manuscript received in May 1984.

9399
CSO: 5500/2607

ITALY

CHARACTERISTICS OF FIBER OPTIC TRANSMISSION SYSTEM

Milan RIVISTA TELETTRA in Italian Oct 84 p 91

[Text] In May 1984, SIRTI [expansion unknown] activated, for the account of the ASST [National Telephones State Board], the 140-Mbits/sec fiber optic transmission system between Padua and Mestre.

As indicated in Fig 1, the system includes the following Telettra equipment:

--Two line terminals located respectively at the Padua and Mestre exchanges;

--Three intermediate regenerators, remotely powered, remotely controlled, and housed in buried containers along the route of the turnpike.

The remotely-supplied power and remote-control signals are fed via copper pairs sheathed in the same cable as the optic fibers.

The system is of Telettra's first-generation class of 140-Mbits/sec fiber optic transmission systems (see RIVISTA TELETTRA No 32).

It operates on multimode fiber in the first window; the line code used is of the 6B/8B type; the electrooptical components used are the laser for transmission and the APD [avalanche photodiode] for reception.

The results of measurements made following installation of the system are shown in Figs 2 and 3. These results are considered good, and in any case, within the limits prescribed in the ASST specification and in the most recent CCITT Recommendations.

Figs 4 and 5 show, respectively, the line terminal frame and the optical transmitter unit.

[End of text; illustrations follow]:

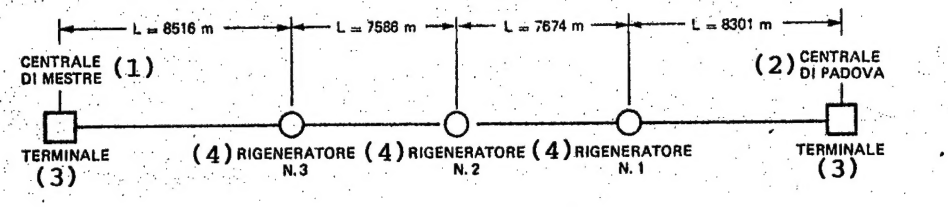


Fig 1 - Schematic of 140-Mbits/sec fiber optic link between Padua and Mestre.

Key:

1. Mestre Exchange.
2. Padua Exchange.
3. Terminal.
4. Regenerator No.__.

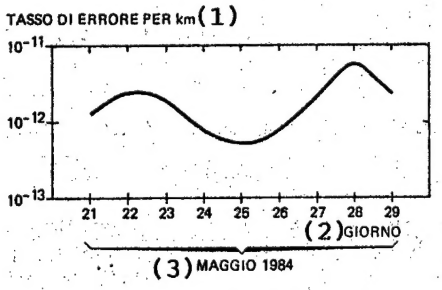


Fig 2 - Recordings of daily error rate per km on Mestre-Padua-Mestre link, with loop at Padua (64 km).

Key:

1. Error rate per km.
2. Day [of month].
3. May 1984.

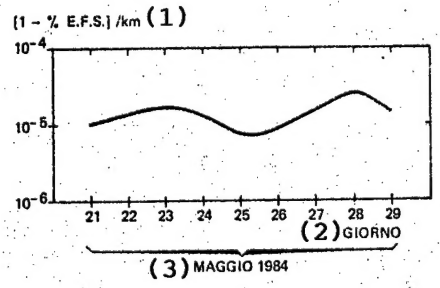


Fig 3 - Daily percentage of "error-affected seconds" recorded on Mestre-Padua-Mestre link, with loop at Padua (64 km).

Key:

1. 1 minus percent of error-free seconds per km.
2. Day [of month].
3. May 1984.

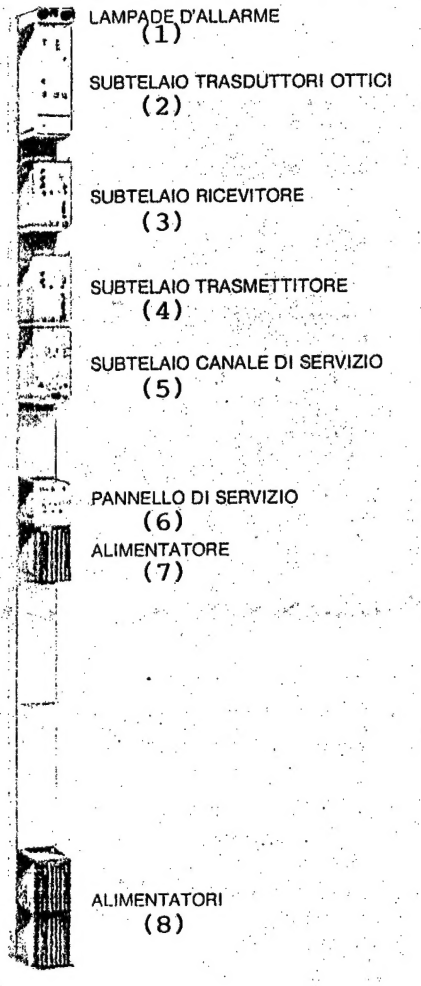


Fig 4 - DT 140-TF: 140-Mbits/sec line terminal for multimode optic fiber in first window.

Key:

1. Signal lamps.
2. Optic transducers subpanel.
3. Receiver subpanel.
4. Transmitter subpanel.
5. Service channel subpanel.
6. Service panel.
7. Power supply.
8. Power supplies.

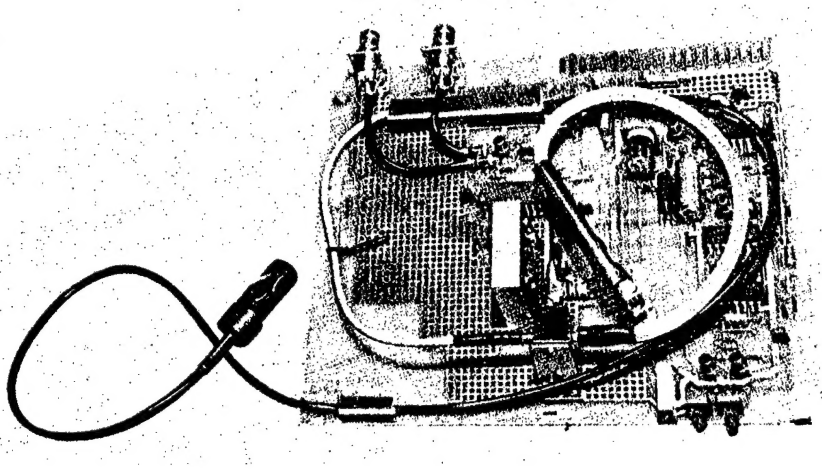


Fig 5 - DT 140-TF: Optic transmitter.

9399
CSO: 5500/2607

END